



Prepared for:
U.S. Environmental Protection Agency
Region 7
11201 Renner Blvd
Lenexa, Kansas 66219

Final Technical Specifications

Madison County Mines Site Operable Unit 05 Catherine Mines and Skaggs Tailings Sub-sites

Madison County, Missouri

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work included is the Operable Unit 05 Remedial Action at the United States Environmental Protection Agency (EPA) Region 7 Madison County Mines Site. Cleanup values were established in the Record of Decision (ROD) in 2012, are as follows: 400 parts per million (ppm) lead (Pb).

Because there are no federal or state cleanup standards for soil contamination, the Environmental Protection Agency (EPA) established the stated cleanup levels based on information in the Baseline Human Health Risk Assessment (BHHRA) and Ecological Risk Assessment (ERA). Cleanup levels were selected (based on preliminary remediation goals, or PRGs) that would both reduce the risk associated with human and ecological exposure to soil contaminants, primarily lead, to an acceptable level and ensure minimal migration of contaminants into the groundwater. The Record of Decision (ROD) identified the action levels for Operable Unit 05 to be the following:

Cleanup levels for mine waste - Consolidation and capping

Arsenic: 180 parts per million (ppm)(mg/kg)

Cobalt: 130 ppm

Lead: 1,460 ppm

Manganese: 2,200 ppm

Nickel: 380 ppm

A determination will be made through 10 percent comparative analyses during the design phase to confirm historic evidence that achieving the cleanup standard for lead in soil will accomplish meeting the cleanup levels for the other chemicals of concern (COCs) including arsenic, cobalt, manganese and nickel.

Cleanup level for soil - excavation

Lead in residential soil: 400 ppm

Lead in recreational soil: 1,250 ppm

Other COCs besides lead present in soil most often coexist with lead; the cleanup levels are expected to be met when the lead concentrations are reduced. Comparative analyses will be incorporated in the remedial design using 10 percent of the samples collected for laboratory analysis to confirm the respective cleanup levels are met.

Cleanup level for floodplain soil - excavation

Lead: 400 ppm

Cleanup levels for sediment - removal

Lead: 150 ppm

Copper and manganese present in the floodplain soil and sediment are predicted to coexist with lead and are projected to be reduced to within their stated cleanup-level concentrations when the lead cleanup level is met. A comparative analysis will be incorporated in the remedial design using 10 percent of the samples analyzed by a laboratory to confirm the respective cleanup levels are met.

Cleanup levels for surface water

Cleanup levels for surface water are not established since the overall exposure is negligible compared to the presence of COCs in sediment and floodplain soils. Surface runoff will be controlled through the engineering design of the cap to prevent future deposition of contamination to ditches, tributaries and streams. The removal of floodplain soils will further enhance surface water quality and will be monitored to-confirm MNR is achieved.

Cleanup levels for groundwater

Cleanup levels for shallow groundwater are not established as numeric values since shallow, perched groundwater contamination is only documented to exist in the waste piles. The RAO for groundwater relates to decreasing the volume of precipitation water infiltrating the waste piles. The reduction of precipitation water percolating into the waste piles will further minimize hydraulic mounding preventing groundwater discharges or seeps to the-surface at the sides and base of the capped areas. Consumption of groundwater will be prevented through environmental covenants with property owners under Missouri Environmental Covenants Act (MoECA) by preventing drilling of wells and potable use of groundwater. Shallow groundwater will be monitored to ensure irrigation outside the waste piles is not occurring.

1.2 CONTRACT DRAWINGS

Five sets of full size contract drawings, maps, and specifications will be furnished to the Contractor without charge. Reference publications will not be furnished.

Contractor shall immediately check furnished drawings and notify the Government of any discrepancies.

1.3 WORK RESCHEDULING

Normal duty hours for work shall be from 7:00 a.m. to 7:00 p.m., Monday through Friday. Requests for additional work shall require written approval from the Contracting Officer 7 days in advance of the proposed work period.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 35 29.13

HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES FOR CONTAMINATED SITES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z358.1 (2009) American National Standard for
Emergency Eyewash and Shower Equipment

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH 85-115 (1985) Occupational Safety and Health
Guidance Manual for Hazardous Waste Site
Activities

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (2008; Errata 1-2010; Changes 1-3 2010;
Changes 4-6 2011) Safety and Health
Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1904 Recording and Reporting Occupational
Injuries and Illnesses

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.120 Hazardous Waste Operations and Emergency
Response

29 CFR 1926 Safety and Health Regulations for
Construction

29 CFR 1926.65 Hazardous Waste Operations and Emergency
Response

1.2 DESCRIPTION OF WORK

This section requires Contractors to implement practices and procedures for working safely and in compliance with OSHA and USACE regulation while performing cleanup activities on uncontrolled hazardous waste sites. Hazards unique to this project include those associated with work around existing ponds, steep slopes, and buried mines shafts of unknown depths.

1.2.1 Catherine Subsite Safety

The Catherine subsite is an operating quarry. All Mine Safety and Health

Administration (MSHA) site safety and operating regulations shall be adhered to.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

SD-03 Product Data

Employee Certificates

A certificate for each worker performing cleanup operations with potential for contaminant-related occupational exposure signed by the safety and health manager and the occupational physician indicating the workers meet the training and medical surveillance requirements of this contract.

1.4 REGULATORY REQUIREMENTS

Comply with EM 385-1-1, OSHA requirements in 29 CFR 1910 and 29 CFR 1926 with work performed under this contract, especially OSHA's Standards 29 CFR 1926.65 and 29 CFR 1910.120 and state specific OSHA requirements where applicable. Submit to the Contracting Officer for resolution matters of interpretation of standards before starting work. The most stringent requirements apply where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary.

1.5 PRECONSTRUCTION SAFETY CONFERENCE

Conduct a preconstruction safety conference prior to the start of site activities and after submission of the Contractor's APP/SSHP. The objective of the meeting will be to discuss health and safety concerns related to the impending work, discuss project health and safety organization and expectations, review and answer comments and concerns regarding the APP/SSHP or other health and safety concerns the Contractor may have. Ensure that those individuals responsible for health and safety at the project level are available and attend this meeting.

1.6 ACCIDENT PREVENTION PLAN/SITE SAFETY AND HEALTH PLAN (APP/SSHP)

Develop and implement a Site Safety and Health Plan and attach to the Accident Prevention Plan (APP) as an appendix (APP/SSHP). Address all occupational safety and health hazards (traditional construction as well as contaminant-related hazards) associated with cleanup operations within the APP/SSHP. Cover each SSHP element in section 28.A.01 of EM 385-1-1 and each APP element in Appendix A of EM 385-1-1. There are overlapping elements in Section 28.A.01 and Appendix A of EM 385-1-1. SSHP appendix elements that overlap with APP elements need not be duplicated in the APP/SSHP provided each SOH issue receives adequate attention and is documented in the APP/SSHP. The APP/SSHP is a dynamic document, subject to change as project operations/execution change. The APP/SSHP will require modification to address changing and previously unidentified health and safety conditions. It is the Contractor's responsibility to ensure that the APP/SSHP is updated accordingly. Submit amendments to the APP/SSHP to the COR as the APP/SSHP is updated. For long duration

projects resubmit the APP/SSHP to the COR annually for review. The APP/SSHP must contain all updates.

1.6.1 Acceptance and Modifications

Prior to submittal, the APP/SSHP must be signed and dated by the Safety and Health Manager and the Site Superintendent. Submit for review 10 days prior to the Preconstruction Safety Conference. Deficiencies in the APP/SSHP will be discussed at the preconstruction safety conference, and be revised to correct the deficiencies and resubmitted for acceptance. Onsite work must not begin until the plan has been accepted. Maintain a copy of the written APP/SSHP onsite. Changes and modifications to must be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Bring to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer any unforeseen hazard that becomes evident during the performance of the work, through the Site Safety and Health Officer (SSHO) for resolution as soon as possible. In the interim, take necessary action to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of this specification or the accepted APP/SSHP will be cause for stopping work until the matter has been rectified.

1.6.2 Availability

Make available the APP/SSHP in accordance with 29 CFR 1910.120, (b)(1)(v) and 29 CFR 1926.65, (b)(1)(v).

1.7 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.7.1 Project/Site Conditions

Refer to the following reports and information for the site description and contamination characterization. Existing site investigation reports including the following can be found in the Administrative Record File located at the Ozark Regional Library - Fredericktown Branch, 115 South Main Street, Fredericktown, Missouri 63645. Another information repository is located at the U.S. Environmental Protection Agency, Region 7 Records Center, 11201 Renner Boulevard, Lenexa, Kansas 66219.

a. EPA Superfund Record of Decision: Catherine Mines and Skaggs Tailings Subsites, Operable Unit 05, Madison County Mines Superfund Site, Madison County, Missouri, CERCLIS ID# MOD098633415, September 2012.

b. Final Madison County Mines Site Remedial Investigation Report, Madison County, Missouri (Volumes I-III); Black & Veatch Special Projects Corp. and Professional Environmental Engineers, Inc.; April 2008.

c. Final Feasibility Study Report, Operable Unit 5, Madison County Mines Site, Madison County, Missouri; Black & Veatch Special Projects Corp. and Professional Environmental Engineers, Inc.; June 2012.

1.8 STAFF ORGANIZATION, QUALIFICATION AND RESPONSIBILITIES

1.8.1 Safety and Health Manager

Safety and Health Manager must be an Industrial Hygienist certified by the American Board of Industrial Hygiene.

1.8.1.1 Additional Qualifications

The Safety and Health Manager must have the following additional qualifications:

- a. A minimum of five years experience in developing and implementing safety and health programs at hazardous waste sites.
- b. Documented experience in supervising professional and technician level personnel.
- c. Documented experience in developing worker exposure assessment programs and air monitoring programs and techniques.
- d. Documented experience in managing personal protective equipment programs and conducting PPE hazard evaluations for the types of activities and hazards likely to be encountered on the project.
- e. Working knowledge of state and Federal occupational safety and health regulations.

1.8.1.2 Responsibilities and Duties

The Safety and Health Manager shall:

- a. Be responsible for the development, implementation, oversight, and enforcement of the APP/SSHP.
- b. Sign and date the APP/SSHP prior to submittal.
- c. Conduct initial site-specific training.
- d. Be available for consultation during the first month of remedial activities and at the startup of each new major phase of work.
- e. Visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the APP/SSHP.
- f. Be available for emergencies.
- g. Provide onsite consultation as needed to ensure the APP/SSHP is fully implemented.
- h. Coordinate any modifications to the APP/SSHP with the Site Superintendent, the SSHO, and the Contracting Officer.
- i. Provide continued support for upgrading/downgrading of the level of personal protection.
- j. Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.

- k. Review accident reports and results of daily inspections.
- l. Serve as a member of the Contractor's quality control staff.

1.8.2 Site Safety and Health Officer

Designate an individual and one alternate as the Site Safety and Health Officer (SSHO). The name, qualifications (education and training summary and documentation), and include work experience of the Site Safety and Health Officer and alternate in the APP/SSHP.

1.8.2.1 Qualifications

The SSHO shall meet the following qualifications:

- a. A minimum of 2 years experience in implementing safety and health programs at hazardous waste sites where Level C personal protective equipment was required.
- b. Documented experience in construction techniques and construction safety procedures.
- c. Working knowledge of Federal and state occupational safety and health regulations.
- d. Specific training in personal and respiratory protective equipment, confined space entry and in the proper use of air monitoring instruments and air sampling methods including monitoring for ionizing radiation.

1.8.2.2 Responsibilities and Duties

The Site Safety and Health Officer shall:

- a. Assist and represent the Safety and Health Manager in onsite training and the day to day onsite implementation and enforcement of the accepted APP/SSHP.
- b. Be assigned to the site on a full time basis for the duration of field activities. The SSHO can have collateral duties in addition to Safety and Health related duties. If operations are performed during more than 1 work shift per day, a site Safety and Health Officer must be present for each shift and when applicable, act as the radiation safety officer (RSO) as defined in paragraph 06.E.02 of EM 385-1-1 on radioactive waste cleanup projects.
- c. Have authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations, MSHA regulations at the Catherine subsite, and all aspects of the APP/SSHP including, but not limited to, activity hazard analyses, air monitoring, monitoring for ionizing radiation, use of PPE, decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log in accordance with 29 CFR 1904..
- d. Have authority to stop work if unacceptable health or safety

conditions exist, and take necessary action to re-establish and maintain safe working conditions.

- e. Consult with and coordinate any modifications to the APP/SSHP with the Safety and Health Manager, the Site Superintendent, and the Contracting Officer.
- f. Serve as a member of the Contractor's quality control staff on matters relating to safety and health.
- g. Conduct accident investigations and prepare accident reports.
- h. Conduct daily safety inspection and document safety and health findings into the Daily Safety Inspection Log. Track noted safety and health deficiencies to ensure that they are corrected.
- i. In coordination with site management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.

1.8.3 Occupational Physician

Utilize the services of a licensed physician, who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board eligible. The physician must be familiar with this site's hazards and the scope of this project. Include the medical consultant's name, qualifications, and knowledge of the site's conditions and proposed activities in the APP/SSHP. The physician will be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1910.120, (f) and 29 CFR 1926.65, (f) and paragraph MEDICAL SURVEILLANCE.

1.8.4 Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other approved agency must be onsite at all times during site operations. They must be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030. These persons may perform other duties but will be immediately available to render first aid when needed.

1.8.5 Safety and Health Technicians

For each work crew in the exclusion zone, one person, designated as a Safety and Health technician, must perform activities such as air monitoring, decontamination, and safety oversight on behalf of the SSHO. They must have appropriate training equivalent to the SSHO in each specific area for which they have responsibility and report to and be under the supervision of the SSHO.

1.9 TRAINING

Meet the following requirements in the Contractor's training program for workers performing cleanup operations and who will be exposed to contaminants.

1.9.1 General Hazardous Waste Operations Training

All Personnel performing duties with potential for exposure to onsite contaminants must meet and maintain the following 29 CFR 1910.120/ 29 CFR 1926.65 (e) training requirements:

- a. 40 hours of off site hazardous waste instruction.
- b. 3 days actual field experience under the direct supervision of a trained, experienced supervisor.
- c. 8 hours refresher training annually.

Onsite supervisors must have an additional 8 hours management and supervisor training specified in 29 CFR 1910.120/29 CFR 1926.65 (e) (4).

1.9.2 Pre-entry Briefing

Prior to commencement of onsite field activities, all site employees, including those assigned only to the Support Zone, must attend a site-specific safety and health training session. This session will be conducted by the Safety and Health Manager and the Site Safety and Health Officer to ensure that all personnel are familiar with requirements and responsibilities for maintaining a safe and healthful work environment. Thoroughly discuss procedures and contents of the accepted APP/SSHP and Sections 01.B.02 and 28.D.03 of EM 385-1-1. Each employee must sign a training log to acknowledge attendance and understanding of the training. Notify the Contracting Officer at least 10 days prior to the initial site-specific training session so government personnel involved in the project may attend.

1.9.3 Periodic Sessions

Conduct periodic onsite training by the SSHO at least weekly for personnel assigned to work at the site during the following week. Address safety and health procedures, work practices, any changes in the APP/SSHP, activity hazard analyses, work tasks, or schedule; results of previous week's air monitoring, review of safety discrepancies and accidents. Convene a meeting prior to implementation of the change must be convened should an operational change affecting onsite field work be made, to explain safety and health procedures. Conduct a site-specific training sessions for new personnel, visitors, and suppliers by the SSHO using the training curriculum outlines developed by the Safety and Health Manager. Each employee must sign a training log to acknowledge attendance and understanding of the training.

1.10 PERSONAL PROTECTIVE EQUIPMENT

1.10.1 Site Specific PPE Program

Provide onsite personnel exposed to contaminants with appropriate personal protective equipment. Components of levels of protection (B, C, D and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Use only respirators approved by NIOSH. Keep protective equipment and clothing clean and well maintained. Include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, and storage of PPE within the PPE section of the APP/SSHP.

1.10.2 Levels of Protection

The Safety and Health Manager must establish and evaluate as the work progresses the levels of protection for each work activity. Also establish action levels for upgrade or downgrade in levels of PPE. Describe in the SSHP the protocols and the communication network for changing the level of protection. Address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, individual medical considerations, etc. within the PPE evaluation protocol.

1.10.2.1 Initial PPE Components

The following items constitute initial minimum protective clothing and equipment ensembles.

a. Level D.

1. Boots with steel toe.
2. Outer gloves, leather or cotton.
3. Hardhat.
4. Safety glasses (when necessary).
5. Hearing protection (when necessary).
6. Blaze orange safety vest (if working near traffic).

1.11 MEDICAL SURVEILLANCE PROGRAM

Meet 29 CFR 1910.120/29 CFR 1926.65 (f) and the following requirements for medical surveillance program for workers performing cleanup operations and who will be exposed to contaminants. Assure the Occupational Physician or the physician's designee performs the physical examinations and reviews examination results. Participation in the medical surveillance program will be without cost to the employee, without loss of pay and at a reasonable time and place.

1.11.1 Frequency of Examinations

Medical surveillance program participants must receive medical examinations and consultations on the following schedule:

- a. Every 12 months
- b. If and when the participant develops signs and symptoms indicating a possible overexposure due to an uncontrolled release of a hazardous substance on the project.
- c. Upon termination or reassignment to a job where medical surveillance program participation is not required, unless his/her previous annual examination/consultation was less than 6 months prior to reassignment or termination.
- d. On a schedule specified by the occupational physician.

1.11.2 Content of Physical Examinations/Consultation

Verify the following information about medical surveillance program participants:

- a. Baseline health conditions and exposure history.
- b. Allergies/sensitivity/susceptibility to hazardous substances exposure.
- c. Ability to wear personal protective equipment inclusive of NIOSH certified respirators under extreme temperature conditions.
- d. Fitness to perform assigned duties.

Provide the occupational physician with the following information for each medical surveillance program participant:

- a. Information on the employee's anticipated or measured exposure.
- b. A description of any PPE used or to be used.
- c. A description of the employee's duties as they relate to the employee's exposures (including physical demands on the employee and heat/cold stress).
- d. A copy of 29 CFR 1910.120, or 29 CFR 1926.65.
- e. Information from previous examinations not readily available to the examining physician.
- f. A copy of Section 5.0 of NIOSH 85-115.
- g. Information required by 29 CFR 1910 Section .134.

1.11.3 Physician's Written Opinion

Obtain and furnish to the Safety and Health Manager; and the employee before work begins, a copy of the physician's written opinion for each employee. Address the employee's ability to perform hazardous waste site remediation work and containing the following:

- a. The physician's verification of the employee's fitness to perform duties as well as recommended limitations upon the employee's assigned work and/or PPE usage.
- b. The physician's opinion about increased risk to the employee's health resulting from work; and
- c. A statement that the employee has been informed and advised about the results of the examination.

1.11.4 Employee Certificates

Provided on employee certificates for each worker performing cleanup operations with potential for contaminant-related occupational exposure signed by the safety and health manager and the occupational physician indicating the workers meet the training and medical surveillance requirements of this contract.

1.11.5 Site Specific Medical Surveillance

Prior to onsite work, medical surveillance program participants must undergo the following medical testing: Blood lead levels, blood arsenic levels, blood cobalt levels, blood manganese levels, and blood nickel levels. Provide an explanation of the site specific medical surveillance testing in the APP/SSHP..

1.12 HEAT STRESS MONITORING AND MANAGEMENT

Document in the APP/SSHP and implement the procedures and practices in section 06.J. in EM 385-1-1 to monitor and manage heat stress.

1.13 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

Maintain, as a minimum, the following items onsite and available for immediate use:

- a. First aid equipment and supplies approved by the consulting physician.
- b. Emergency eyewashes and showers that comply with ANSI/ISEA Z358.1.
- c. Provide fire extinguishers of sufficient size and keep in all vehicles and at any other site locations where flammable or combustible materials are present .

1.14 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

An Emergency Response Plan, that meets the requirements of 29 CFR 1910.120 (1) and 29 CFR 1926.65 (1), must be developed and implemented as a section of the APP/SSHP. In the event of any emergency associated with remedial action, without delay, alert all onsite employees and as necessary offsite emergency responders that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Train employees that are required to respond to hazardous emergency situations to their level of responsibility according to 29 CFR 1910.120 (q) and 29 CFR 1926.65 (q) requirements. Rehearse the plan regularly as part of the overall training program for site operations. Review the plan periodically and revised as necessary to reflect new or changing site conditions or information. Provide copies of the Emergency Response Portion of the accepted APP/SSHP to the affected local emergency response agencies. Address, as a minimum, the following elements in the plan:

- a. Pre-emergency planning. Coordinate with local emergency response providers during preparation of the Emergency Response Plan. At a minimum, coordinate with local fire, rescue, hazardous materials response teams, police and emergency medical providers to assure all organizations are capable and willing to respond to and provide services for on-site emergencies. Ensure the Emergency Response Plan for the site is compatible and integrated with the local fire, rescue, medical and police security services available from local emergency response planning agencies.
- b. Personnel roles, lines of authority, communications for emergencies.
- c. Emergency recognition and prevention.

- d. Site topography, layout, and prevailing weather conditions.
- e. Criteria and procedures for site evacuation (emergency alerting procedures, employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).
- f. Specific procedures for decontamination and medical treatment of injured personnel.
- g. Route maps to nearest prenotified medical facility. Site-support vehicles must be equipped with maps. At the beginning of project operations, drivers of the support vehicles must become familiar with the emergency route and the travel time required.
- h. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, state, and local environmental agencies; as well as Safety and Health Manager, the Site Superintendent, the Contracting Officer and/or their alternates).
- i. Criteria for initiating community alert program, contacts, and responsibilities.
- j. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or release of toxic materials occurs during the course of the project, the appropriate government agencies must be immediately notified. In addition, verbally notify the Contracting Officer and the local district safety office immediately and receive a written notification within 24 hours. Include within the report the following items:
 - (1) Name, organization, telephone number, and location of the Contractor.
 - (2) Name and title of the person(s) reporting.
 - (3) Date and time of the incident.
 - (4) Location of the incident, i.e., site location, facility name.
 - (5) Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.
 - (6) Cause of the incident, if known.
 - (7) Casualties (fatalities, disabling injuries).
 - (8) Details of any existing chemical hazard or contamination.
 - (9) Estimated property damage, if applicable.
 - (10) Nature of damage, effect on contract schedule.
 - (11) Action taken to ensure safety and security.

(12) Other damage or injuries sustained, public or private.

k. Procedures for critique of emergency responses and follow-up.

1.15 CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

A copy of a Contractor-generated certificate of worker/visitor acknowledgement must be completed and submitted for each visitor allowed to enter contamination reduction or exclusion zones, and for each employee, following the example certificate at the end of this section.

1.16 INSPECTIONS

Attach to and submit with the Daily Quality Control reports the SSHO's Daily Inspection Logs. Include with each entry the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special safety and health issues and notes, and signature of preparer.

1.17 SAFETY AND HEALTH PHASE-OUT REPORT

Submit a Safety and Health Phase-Out Report in conjunction with the project close out report and will be received prior to final acceptance of the work. Include the following minimum information :

- a. Summary of the overall performance of safety and health (accidents or incidents including near misses, unusual events, lessons learned, etc.).
- b. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and on site facilities.
- c. Summary of exposure monitoring and air sampling accomplished during the project.
- d. Signatures of Safety and Health Manager and SSHO.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 35 45.00 10

CHEMICAL DATA QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 200-1-3 (2001) Engineering and Design --
Requirements for the Preparation of
Sampling and Analysis Plans

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 240-B-01-003 (2001) EPA Requirements for QA Project
Plans (QA/R-5)

EPA 505-B-04-900A (2005) Uniform Federal Policy for Quality
Assurance Project Plans

EPA 600-R-98-018 (2002) Guidance on Quality Assurance
Project Plans (G-5)

1.2 ACRONYMS

The definition of acronyms used by the Contractor that pertain to chemical data quality control shall be clearly defined for all contract related products and communications.

1.3 MEASUREMENT AND PAYMENT

Separate payment will not be made for providing and maintaining the chemical data quality requirements including the chemical data quality management, chemical data validation, minimum chemical data reporting requirements, and chemical data quality submittal requirements; these costs shall be included in the applicable unit prices or lump sum prices contained in the bidding schedule.

1.4 QUALITY ASSURANCE PROJECT PLAN (QAPP) REQUIREMENTS

The QAPP shall meet the requirements of the Uniform Federal Policy for Quality Assurance Project Plans, EPA 505-B-04-900A. Guidance for the creation of the QAPP can be found in EPA 600-R-98-018 and EPA 240-B-01-003.

1.4.1 Site History

The Madison County Mines Site, Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number MOD098633415, is located near Fredericktown in southeastern Missouri. The Site is located at the southern end of the Old Lead Belt

where heavy metal mining has occurred since the early 1700s. The Site is located about 80 miles south of St. Louis, Missouri, on the southeastern edge of the Ozark Uplift. Past mining operations have left at least 13 identified major mine waste areas, in the form of tailings and chat deposits, from smelting and mineral processing operations in Madison County. Chat deposits include sand to gravel sized material resulting from the crushing, grinding, and dry separation of the ore material. Tailings deposits include sand and silt sized material resulting from the wet washing or floatation separation of the ore material. The mine waste contains elevated levels of lead and other heavy metals which pose a threat to human health and the environment. The Madison County Mines Site was placed on the National Priorities List (NPL) on September 29, 2003. A more detailed description of the Catherine and Skaggs sub sites can be found below.

Lead ore was discovered in the area of Mine La Motte (northwest Fredericktown) by French explorers around 1715 (Hall, 1939). The area was already known to and likely was being exploited by local natives. Mining commenced in the early 1720s and continued intermittently on a comparatively small basis through the 18th century (Shoemaker, date unknown). Mining and beneficiation activities increased significantly at Mine La Motte and what is now known as the Madison Mine beginning in the mid-1840s and expanded throughout Madison County in the period following the Civil War, when the diamond drill became available as an exploration tool (Anonymous). Most of the smaller mines that are the subject of these sampling activities were likely located and operated at this time. Mining in Madison County has produced copper, lead, cobalt, nickel, iron, and small amounts of zinc, silver, and tungsten (Tolman, 1933; James, 1949; USGS et al., 1967). Ore crushing and beneficiation activities took place at many sites in Madison County, including the Catherine Mine and Skaggs sub sites.

Property ownership is taken from the most recent GIS database available, provided by Intrinsicorp (Madison County GIS database, <http://madison.villagis.net>, 2013), for the area and was supplemented with research conducted during the reconnaissance.

The Catherine Mine sub site is located on the west side of Highway H, about 2 miles northwest of Fredericktown in Section 2, Township 33N, Range 6E. The sub site is about 2,500 feet north of the intersection of Highways H and 67 and is accessed from Highway H. The Catherine sub site presently consists of remnant chat piles, most of which have been excavated and removed, and a 3.5 acre pond that receives runoff and drainage from the chat area. Surface runoff from the northern part of the site drains northeastward along perennially flowing Logtown Branch, a tributary to the Little St. Francis River (LSFR). Runoff from the southern part of the site flows through an unnamed tributary to Plum Creek, a tributary to the LSFR.

Much of the former chat disposal area is now covered with soil, either lead contaminated or quarry overburden. Chat was identified extending into a wooded area west of the chat disposal area; this chat is covered with a few inches of forest duff and soil. Chat is also exposed along the southern shore of the settling pond on the north side of the chat piles. It is unknown if the entire pond is underlain by chat. Observations of the surface drainages show that both Logtown Branch and the unnamed Plum Creek tributary are free of visible chat and tailings. Chat at the Catherine sub site consists of angular fragments of crystalline dolomite and silica, ranging from fine sand to fragments of 10 mm, with occasional sand- and gravel-sized fragments. The chat, which has a light gray to light brown

color, contains less than 1 percent black, metallic minerals. In general, the material is moderately sorted and matrix supported.

The Skaggs Mine sub site is located near the intersection of Highways H and 67, about 2 miles northwest of Fredericktown in Section 2, T33N, R6E. The sub site is about a quarter mile south of the Catherine Mine sub site and possibly was part of original Catherine Mine sub site. A portion of the Skaggs sub site located west of Highway H and is accessed from Highway H.

The Skaggs sub site presently consists of remnant chat piles, most of which have been excavated and removed, piles of sawdust that locally cover chat, an active garage/shop area, a small scrap yard, and a few miscellaneous buildings that are not in use. Runoff from the western portion of the site drains southwestward through an ephemeral drainage to the unnamed Plum Creek tributary that flows south from the Catherine sub site, and thence to the LSFR. Runoff from the eastern portion of the site drains eastward through an unnamed intermittent stream that discharges to the LSFR.

Chat was identified extending westward along the base of the sawdust piles into a grassy meadow where it is covered with a few inches of soil. Barren chat is exposed throughout most of the central and northern Skaggs sub site at depths ranging from a few inches to a few feet and the southern margin of the chat extends into a wooded area. Observations of the surface drainages show that both the western ephemeral drainage and the eastern intermittent drainage contain visible chat and tailings in the areas from which chat was excavated; downstream of the historic piles, the streams are generally free of chat.

Chat at the Skaggs sub site consists of angular fragments of crystalline dolomite and silica, ranging from fine sand to fragments of 10 mm, with occasional sand and gravel-sized fragments. The chat, which has a light gray to light brown color, contains less than 1 percent black, metallic minerals. In general, the material is moderately sorted and matrix supported.

1.4.2 Data Quality Objectives (DQO)

Sample acquisition, chemical analysis, and chemical parameter measurements shall be performed so that the resulting data meet and support data use requirements. The main objective of the Remedial Action (RA) sampling is to verify the cleanup values for the site have been met.

The objective of the QAPP is to provide a guideline for maintaining the quality of data generated during the RA sampling efforts at the site.

Specific objectives include developing field activity procedures, field documentation procedures, quality control (QC) procedures for laboratory and field activities, and quality assurance (QA) reporting procedures that will provide legally and scientifically defensible results. These objectives will also provide data which is comparable to historical data whenever possible. The purpose of this section is to define measurements objectives, method detection limits, and QC parameters.

The soil samples will be analyzed in the field or RA project office with an x-ray fluorescence (XRF) spectrometer. The XRF instrument will be calibrated for lead in accordance with the manufacturer's instructions. These samples will be analyzed for lead.

QA/QC objectives are established to ensure that all data collected during the investigation are of acceptable quality to support remedial response decisions. The implementation of appropriate QA/QC procedures allows for development of meaningful technical decisions.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

SD-03 Product Data

Sampling and Analysis Plan (SAP)

The SAP including the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP), no later than 30 days after receipt of notice to proceed.

Chemical Data Final Report (CDFR)

The CDFR, within 30 days of completing work at the site, before final payment. Each report shall be labeled with the contract number, project name and location.

1.6 QUALIFICATIONS

1.6.1 Chemical Quality Control Officer

As a minimum, the Contractor's Chemical Quality Control Officer shall have: 5 years of experience related to investigations, studies, design and remedial actions at HTRW sites; and 2 field seasons (or one continuous calendar year experience) in calibration and operation of various field monitoring devices as well as standard analytical chemistry methods common for analyzing soil, water, air and other materials for chemical contamination assessment, including hazardous waste manifesting. The Chemical Quality Control Officer shall ensure that all chemistry related objectives including responsibilities for DQO definitions, sampling and analysis, project requirements for data documentation and validation, and final project reports are attained. The Chemical Quality Control officer need not be present onsite during routine sampling, but shall be available for consultation with Government and Contractor personnel.

1.6.2 Environmental Sampler

As a minimum, the Contractor's Environmental Sampler shall have: 3 years of experience in the development and preparation of SAP and work plans; and 2 field seasons of experience with the particular field screening techniques for use on this project. The Environmental Sampler shall collect all onsite samples and perform all field screening tests. The Environmental Sampler shall review the sampling results, and provide recommendations for the Contractor's sampling program. The Environmental Sampler shall be onsite during excavation and stockpiling operations involving contaminated soil or soil to be checked for contamination.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Provide chemical sample acquisition, sample analysis, instrumental measurements of chemical parameters for chemical data quality control. An effective chemical data quality control system shall be established that meets the requirements for the chemical measurement DQO applicable to the project. The system shall cover chemical measurements pertaining to and required for Contractor and subcontractor produced chemical data. Control field screening, sampling, and testing in conjunction with remedial activities to meet all DQO; minimize the amount of excavated material requiring temporary storage; prevent dilution of contaminated soils with clean soils; and ensure completion of work within the required time.

3.2 QUALITY CONTROL (QC) PLAN

The QC Plan shall incorporate the qualification, authority, and responsibility of all chemical quality management and support personnel. Chemical measurements, including sampling and/or chemical parameter measurement, will not be permitted to begin until after production and acceptance of the QC Plan and Government approval of the QAPP.

3.2.1 Chemistry Elements of the QC Plan

To cover contract related chemical measurements by the Contractor and all subcontractors, the QC Plan shall include the following as a minimum.

3.2.1.1 Qualifications

Names, education, experience qualifications, authorities, and decision-making responsibilities of all chemical quality management and support personnel. The QC Plan shall contain a copy of a letter from the project QC manager designating and authorizing a Chemical Quality Control Officer and chemical quality control organization staff.

3.2.1.2 Authority and Responsibility

A diagram, flow chart, or figure clearly depicting the chemical data quality management and support staff and the authority and responsibility of each for chemical sampling and analysis, procedures for corrective actions, deliverables and submittals, deviations and changes, chemical quality documentation, data validation, minimum data reporting requirements, and DQO for chemical parameter measurement by the Contractor and subcontractors. The contents of this section of the CQC Plan shall be included in the applicable "Project Organization" elements of the FSP and the QAPP.

3.3 SAMPLING AND ANALYSIS PLAN (SAP)

The SAP shall be prepared in accordance with CDQC requirements and EM 200-1-3. The SAP shall be a single document that contains two distinct elements: FSP and QAPP. Sections of the FSP and QAPP shall be cross referenced. The SAP shall confirm the Contractor's understanding of the contract requirements for chemical data quality control, and shall

describe procedures for field sampling and sample submittal for analysis, field chemical parameter measurement, data documentation, data assessment and data reporting requirements. The SAP shall delineate the methods the Contractor intends to use to accomplish the chemical quality control items to assure accurate, precise, representative, complete, legally defensible and comparable data. The SAP shall describe all chemical parameter measurements for all matrices for all phases of the remediation contract. As a single interrelated document, the SAP shall be provided to field and laboratory personnel. The Contractor may propose original/innovative approaches to chemical parameter measurements for cost reduction and remediation efficiency by abbreviated sampling, contingency sampling and/or contingency analysis, indicator or tracer analysis, onsite analytical services, equivalency or screening methods. The SAP shall clearly identify the Contractor obtained laboratories. Furnish copies of the Government approved SAP to all laboratories and the Contractor's field sampling crew. The SAP shall address all levels of the investigation with enough detail to become a document which may be used as an audit guide for field and laboratory work.

3.3.1 Field Sampling Plan

The Contractor is to follow the field sampling plan prepared for the project by Black & Veatch, dated September 2014.

3.3.2 QAPP

The QAPP shall contain necessary technical detail and direction for field and laboratory personnel to understand project sample analysis, quality control and data reporting requirements, analytical methods, required detection limits, QC requirements, and data validation and reporting requirements.

3.4 CONTROL OF CHEMICAL DATA QUALITY

Contractor chemical data quality control shall ensure that a quality control program is in place that assures sampling and analytical activities and the resulting chemical parameter measurement data comply with the DQO and the requirements of the SAP. Utilize the three-phase control system that includes a preparatory, initial and follow-up phase for each definable feature of work.

3.5 CHEMICAL DATA FINAL REPORT (CDFR)

The CDFR shall be produced including a summary of quality control practices employed and all chemical parameter measurement activities after project completion. As a minimum, the CDFR shall contain the following:

- a. Summary of project scope and description.
- b. Summary of any deviations from the design chemical parameter measurement specifications.
- c. Summary of chemical parameter measurements performed as contingent measurements.
- d. Summary discussion of resulting data including achieving data reporting requirements.
- e. Summary of achieving project specific DQO.

- f. Presentation and evaluation of the data to include an overall assessment on the quality of the data for each method and matrix.
- g. Internal QC data generated during the project, including tabular summaries correlating sample identifiers with all blank, matrix spikes, surrogates, duplicates, laboratory control samples, and batch identifiers.
- h. A list of the affected sample results for each analyte (indexed by method and matrix) including the appropriate data qualifier flag (J, B, R, etc.), where sample results are negatively impacted by adverse quality control criteria.
- i. Summary of field and laboratory oversight activities, providing a discussion of the reliability of the data, QC problems encountered, and a summary of the evaluation of data quality for each analysis and matrix as indicated by the laboratory QC data and any other relevant findings.
- j. Conclusions and recommendations.

3.6 DOCUMENTATION

Documentation records shall be provided as factual evidence that required chemical data has been produced and chemical data quality has been achieved. The documentation shall comply with the requirements specified in paragraphs SAMPLING AND ANALYSIS PLAN and CHEMICAL DATA FINAL REPORT (CDFR).

3.7 NOTIFICATION OF NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. Take immediate corrective action after receipt of such notice.

-- End of Section --

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD (2009) Manual of Uniform Traffic Control Devices

1.2 CONSTRUCTION SITE PLAN

Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.3 IDENTIFICATION OF EMPLOYEES

The Contractor shall be responsible for furnishing each employee, and for requiring each employee engaged in the work, to display identification, as approved and directed by the Contractor Officer's representative.

1.4 EMPLOYEE PARKING

Contractor employees will park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable or approved walking distance of the construction site. Contractor employee parking must not interfere with existing and established parking requirements of the government installation.

1.5 AVAILABILITY AND USE OF UTILITY SERVICES

Contractor shall provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

1.5.1 Payment for Utility Services

Contractor shall be responsible for arranging and paying for all temporary utility services needed to support remediation activities and administrative offices.

1.5.2 Final Meter Reading

Contractor shall remove all the temporary distribution lines, meter bases, and associated paraphernalia. Pay all outstanding utility bills before final acceptance of the work by the Government.

1.5.3 Telephone

Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.5.4 Sanitation

Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer and periodically empty wastes into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into any municipal, district, or commercial sanitary sewer system. Any penalties and / or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times without nuisance. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

Contractor shall provide temporary sewer and sanitation facilities that are self-contained units with both urinals and stool capabilities. Ventilate the units to control odors and fumes and empty and clean them at least once a week or more often if required by the Contracting Officer. The doors shall be self-closing. The exterior of the unit shall match the base standard color. Locate the facility behind the construction fence or out of the public view.

1.6 BULLETIN BOARD

Immediately upon beginning work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 inches by 46 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer's representative. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer's representative. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of the work the bulletin board shall be removed and remain property of the Contractor.

3.3 TRAFFIC PROVISIONS

1.7 Maintenance of Traffic

a. Conduct operations in a manner that will not close any thoroughfare or interfere in any way with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior to the proposed modification date, and provide a Traffic Control Plan detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Make all

notifications and obtain any permits required for modification to traffic movements outside Station's jurisdiction. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at contractors expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.

1.8 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of any damage to roads caused by construction operations.

1.9 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations without notification to and approval by the Contracting Officer's representative.

1.10 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Treat dust abatement on access roads with applications of calcium chloride, water sprinklers, or similar methods or treatment.

1.11 CONTRACTOR'S TEMPORARY FACILITIES

1.11.1 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.11.2 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

1.11.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. The Contractor is responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.11.4 Appearance of Trailers

a. Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on installation property.

b. Paint using suitable paint and maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal.

1.11.5 Maintenance of Storage Area

a. Keep fencing in a state of good repair and proper alignment. Grassed or unpaved areas, which are not established roadways, will be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways, should the Contractor elect to traverse them with construction equipment or other vehicles; gravel gradation will be at the Contractor's discretion. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers will be edged or trimmed neatly.

1.11.6 Security Provisions

Provide adequate outside security lighting at the Contractor's temporary facilities. The Contractor will be responsible for the security of its own equipment; in addition, the Contractor will notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.12 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store within the fenced area described above or at the supplemental storage area any materials resulting from demolition activities which are salvageable. Neatly stacked stored materials not in trailers, whether new or salvaged.

1.13 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletinboard, signs, barricades, haulroads, and any other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence that will become the property of the Contractor. Restore to the original or better condition, areas used by the Contractor for the storage of equipment or material, or other use. Gravel used to traverse grassed areas must be removed and the area restored to its

original condition, including top soil and seeding as necessary.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 57 23

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 GENERAL

1.1 SUMMARY

The work consists of implementing the storm water pollution prevention measures to prevent sediment from entering streams or water bodies as specified in this section in conformance with the requirements of the National Pollutant Discharge Elimination System (NPDES).

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

MISSOURI DEPARTMENT OF TRANSPORTATION (MODOT)

MODOT	Missouri Standard Specifications for Highway Construction
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1.3 EROSION AND SEDIMENT CONTROLS

The controls and measures required of the Contractor are described below.

1.3.1 Stabilization Practices

The stabilization practices to be implemented include temporary and permanent seeding, mulching, geotextiles, erosion control matts, etc. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, initiate stabilization practices as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

1.3.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases or is precluded by unsuitable conditions caused by the weather, initiate stabilization practices as soon as practicable after conditions become suitable.

1.3.1.2 No Activity for Less Than 21 Days

When the total time period in which construction activity is temporarily ceased on a portion of the site is 21 days minimum, stabilization practices do not have to be initiated on that portion of the site until 14 days have elapsed after construction activity temporarily ceased.

1.3.1.3 Protection of Erodible Soils

Immediately finish the earthwork brought to a final grade, as indicated or specified, and protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of

exposure of unprotected soils.

1.3.2 Structural Practices

Implement structural practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement structural practices in a timely manner, during the construction process, to minimize erosion and sediment runoff. Include the following devices; Location and details of installation and construction are shown on the drawings.

1.3.2.1 Silt Fences, Mesh Reinforced Silt Fences, and Super Silt Fences

Provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Properly install silt fences to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Install silt fences in the locations indicated on the drawings. Obtain approval from the Contracting Officer prior to final removal of silt fence barriers.

1.3.2.2 Straw Bales

Provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. If bales are used, properly place the bales to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in a area between a ridge and drain, place the bales as work progresses, remove/replace/relocate the bales as needed for work to progress in the drainage area). Show on the drawings areas where straw bales are to be used. The Contracting Officer will approve the final removal of straw bale barriers. Provide rows of bales of straw as follows:

- a. Along the downhill perimeter edge of all areas disturbed.
- b. Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.
- c. Along the toe of all cut slopes and fill slopes of the construction areas.
- d. Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Space the rows a maximum of 200 feet apart.
- e. Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Space the rows a maximum of 100 feet apart.
- f. At the entrance to culverts that receive runoff from disturbed areas.

1.3.2.3 Stabilized Construction Entrance

In order to ensure that sediment is not transported into a situation where it can be delivered off-site, stabilized construction entrances should be used when construction equipment is frequently crossing or entering paved roadways. Stabilized construction entrances should be built with rock of sufficient size to cause mud and dirt to fall off of the tires of the construction equipment. Geotextile fabric may be necessary for placement

below the stabilized entrance in some soil conditions to prevent the rock entrance from subsiding into the soil. In muddy situations, the voids between the rocks will always fill up with soil particles and as such, additional stone will need to be applied periodically and when repair is required.

The purpose of the stabilized entrance is to reduce the amount of sediment that will be transported onto the driving surface. However, the driving surface at the point of the active crossing cannot remain clean without additional measures such as sweeping or grading.

When accumulated sediment is removed from these BMPs, the material shall be disposed of in locations where sediment will not erode into the construction areas or into natural waterways.

1.3.2.4 Stone check Dams/Stone Filter Rings

Temporary sediment control devices, like mulch berms or stone check dams/stone filter rings, should be installed at the downgrade project limits (outfalls and perimeter) PRIOR to earthwork, to keep soil on the site.

MODOT has two categories of ditch checks: rock and alternate ditch checks. These erosion and sediment control structures are typically used when the road ditch has been "cut" or "rough cut" to its final or near final dimensions, before the application of seed and mulch; however, they may also be installed prior to achieving final ditch grade in order to prevent erosion and protect from sediment loss.

1.3.2.5 Compost Logs

See Paragraph Compost Logs in Part 2 for details.

1.3.2.6 Erosion Control Matting

Erosion control blankets (ECBs), erosion stabilization mats, and turf reinforcement mats (TRMs) are designed to reinforce vegetation.

1.3.3 Vegetation and Mulch

- a. Provide temporary protection on sides and back slopes as soon as rough grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.
- b. Seeding: Provide new seeding where ground is disturbed. The seeding operation will be as specified in Section 32 92 19 SEEDING.

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

Synthetic geotextile fabric at 20 percent (maximum) elongation shall have a filtering efficiency of 85 percent and a standard strength of 30 pounds

/linear inch if support wire is used. If support wire is not used, fabric should have a high strength of 50 pounds/linear inch. The fabric should also contain ultraviolet light inhibitors and stabilizers. Minimum design life should be at least 6 months.

2.1.2 Silt Fence Stakes and Posts

Use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 by 2 inches when oak is used and 4 by 4 inches when pine is used, and have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds/linear foot and a minimum length of 5 feet.

2.1.3 Support Wire

Support wire should be wire fence (14 gauge with 6 inch mesh) and used when standard strength fabric is used.

2.1.4 Mesh Reinforced Silt Fences

When support fence is used, the mesh shall be fastened securely to the up-slope side of the post. The mesh shall extend into the trench a minimum of 2 inches and extend a maximum of 36 inches above the original ground surface. When self-supported fence is used, the geotextile shall be securely fastened to fence posts.

2.1.5 Super Silt Fences

If wire fence reinforcement is used, it should be 36 inches high, 14 gauge, and a maximum mesh spacing of 6 inches. The fence should be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tie wires or hog rings. The wire should extend into the trench a minimum of two inches.

2.2 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. Provide bales with a standard cross section of 14 by 18 inches. Wire-bound or string-tie all bales. Use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimensions of 2 by 2 inches in cross section and have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds/linear foot and a minimum length of 3 feet.

2.3 Temporary Construction Entrances

Temporary construction entrances should be constructed of clean 3 inch to 5 inch open graded rock. The entrance should be a minimum of 12 feet wide and 50 feet long. Minimum thickness of the open graded rock shall be 6 inches.

Additional lifts of rock should be added if the surface of the initial drive deteriorates or becomes too muddy to be effective. In locations where an existing driveway or street extends at least 50 feet into the site, the existing driveway may serve as the construction entrance, and construction of a new gravel entrance is not necessary unless warranted by

job conditions. Vehicle wheels should be cleaned to remove mud prior to entrance on to public right of ways. When washing is required, it should be done on an area, stabilized with crushed stone, which drains into a sediment trap. Streets adjacent to the site are required to be completely cleaned of sediment and debris daily.

2.3.1 Graded Rock

Clean 3 inch to 5 inch open graded rock.

2.3.2 Geotextile Separation Filter Fabric

- a. AASHTO Class 1.
- b. Permittivity = 1.0 sec-1 minimum.
- c. L&M Supply LM 800 or approved equivalent.

2.4 Stone Check Dams/Stone Filter Rings

Stone check dams/stone filter rings will typically be composed of rock with a predominant size between 4 inches and 12 inches, but this size may be adjusted to incorporate larger sizes if site conditions warrant. In areas of clay soils, where additional filtration may be needed, the upgrade face of the check can be capped with smaller stone, filter fabric or another approved filtering media.

2.4.1 Clean Rip-Rap

Clean Rip-rap. D50= 9 inches.

2.4.2 Geotextile Separation Filter Fabric

- a. AASHTO Class 1.
- b. Permittivity = 1.0 sec-1 minimum.
- c. L&M Supply LM 800 or approved equivalent.

2.5 Compost Logs

At the discretion of the engineer, the following product examples or other approved BMPs may be substituted for perimeter geotextile silt fence. These devices should be installed in accordance with manufacturer recommendations. In the case of the wattles, socks and log devices, if practical and possible, a cradle trench should be created to lay the product in to ensure proper contact with the ground surface. This may not be appropriate if installing these devices in areas with existing grass cover, such as yards, or in areas with shallow utilities or bedrock beneath; however, care should be taken to ensure flush contact with the ground surface. Thought should also be put into product choice based on expected longevity, as some devices listed below will decompose or break down more quickly than others, and may require replacement or multiple replacements during the life of a job. In general, perimeter compost logs installations should have a minimum of 8 inch in effective height unless site conditions warrant a higher or lower effective height.

2.5.1 Example Products

Sediment STOP Terra-Tubes Sediment Logs, Wattles Compost Filter Socks/Berms Triangular Silt Dike, or approved equal.

2.6 Erosion Control Matting

Twelve month biodegradable matting shall be used.

Type 2	Single Photodegradable Net	12 Months Lifespan	Slopes 3:1 or Flatter
Type 3	Double Photodegradable Net	12-18 Months Lifespan	Slopes 2:1 or Flatter

Specific material specifications are found in MODOT Section 1011.

PART 3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Extend silt fences a minimum of 16 inches above the ground surface without exceeding 34 inches above the ground surface. Provide filter fabric from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, splice together filter fabric at a support post, with a minimum 6 inch overlap, and securely sealed. Excavate trench approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4 by 4 inch trench shall be backfilled and the soil compacted over the filter fabric. Remove silt fences upon approval by the Contracting Officer.

3.2 INSTALLATION OF STRAW BALES

Place the straw bales in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Install straw bales so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. Entrench and backfill the barrier. Excavate a trench the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), backfill the excavated soil against the barrier. Conform the backfill soil with the ground level on the downhill side and build up to 4 inches against the uphill side of the barrier. Scatter loose straw over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Securely anchor each bale by at least two stakes driven through the bale. Drive the first stake or steel post in each bale toward the previously laid bale to force the bales together. Drive stakes or steel pickets a minimum 18 inches deep into the ground to securely anchor the bales.

3.3 FIELD QUALITY CONTROL

Maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. Use the following procedures to maintain the protective measures.

3.3.1 Silt Fence Maintenance

Inspect the silt fences in accordance with Paragraph "Inspections" of this section. Any required repairs shall be made promptly. Pay close attention to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, replace the fabric promptly. Remove sediment deposits when deposits reach one-third of the height of the barrier. Remove a silt fence when it is no longer required. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall receive erosion control.

3.3.2 Straw Bale Maintenance

Inspect straw bale barriers in accordance with paragraph, titled "Inspections". Pay close attention to the repair of damaged bales, end runs and undercutting beneath bales. Accomplish necessary repairs to barriers or replacement of bales in a promptly manner. Remove sediment deposits when deposits reach one-half of the height of the barrier. At the each end of each row turn bales uphill when used to retain sediment. Remove a straw bale barrier when it is no longer required. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. Seed the areas disturbed by this shaping in accordance with Section 32 92 19 SEEDING.

3.3.3 Stone Check Dams/Stone Filter Rings

Stone check dams/stone filter rings shall be placed and constructed according to the plans. In some cases local conditions may dictate some deviation from the dimensions and shape that are shown in the Standard Plans; however, deviations from Standard Plans must still ensure that sediment capture and erosion control is occurring.

Stone check dams/stone filter rings shall be checked for sediment accumulation after each runoff event. Sediment shall be removed when it reaches 1/2 of the original height, or before. Sediment removal will include removal and disposition in a location where it will not erode into construction areas or watercourses. Inspections shall be made to ensure that the center of the check is lower than the edges. This will ensure that water overflow will be directed into the middle of the roadway ditch. Erosion caused by high flows around the edges of the ditch check shall be identified in routine inspections and shall be corrected so as to protect backslopes and inslopes, as well as the effectiveness of the BMP. Stone check dams/stone filter rings shall remain in place until the engineer directs that they be removed once adequate stabilization (vegetative cover, rock, concrete, etc.) upgrade of the structures has been achieved in accordance with the permit. Upon removal, the contractor shall remove and dispose of any excess silt accumulations, grade and dress the area to the satisfaction of the engineer, and establish stabilization on all bare areas. As a general rule for stone check dams/stone filter rings, once the area has reached final stabilization, any collected sediment should be removed and stone check dams/stone filter rings can be graded out within the ditch line, serving a similar purpose as a liner. In rare cases, stone check dams/stone filter rings may remain in place permanently, and resultant accumulated sediment shall be allowed to develop vegetative cover as a permanent feature of the right of way. Similarly, biodegradable structures and their accumulated sediment may be allowed to remain in place if the engineer determines that removal will

destabilize the ditch. In cases of compost, mulch, etc. filled checks, the wooden stakes should be pulled and the biodegradable netting cut to encourage more rapid degradation. If the netting is non-biodegradable, the netting shall be cut and removed along with the stakes, but the biodegradable filling may be left to decompose.

3.3.4 Erosion Control Matting

Prior to installation of blankets or mats the ground should be smooth, with no large rocks, vegetation or rills on the surface. Areas where blankets are to be used shall be properly prepared with topsoil or soil conditioning, and fertilized if required, and seeded before blankets are placed. The blankets shall be placed smoothly but loosely on the soil surface without stretching. Blankets at the top of the slope should be trenched in beyond the crest of the slope so as to avoid undercutting. Blankets and mats should be inspected at the same frequency as all other erosion and sediment control items. Malfunctions must be repaired in a timely manner or else slope shaping, grading and reinstallation will be required.

3.4 INSPECTIONS

3.4.1 General

Inspect disturbed areas of the construction site, areas that have not been finally stabilized used for storage of materials exposed to precipitation, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Conduct inspections at least once every month where sites have been finally stabilized.

3.4.2 Inspections Details

Inspect disturbed areas and areas used for material storage that are exposed to precipitation for evidence of, or the potential for, pollutants entering the drainage system. Observe erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan to ensure that they are operating correctly. Inspect discharge locations or points to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Inspect locations where vehicles exit the site for evidence of offsite sediment tracking.

-- End of Section --

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 2487 (2011) Soils for Engineering Purposes
(Unified Soil Classification System)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846.3-3 (1999, Third Edition, Update III-A) Test
Methods for Evaluating Solid Waste:
Physical/Chemical Methods

1.2 DEFINITIONS

1.2.1 Clay Material

Clay materials used in the capping system for repository areas shall be comprised of materials classified by ASTM D 2487 as CL, CH, SC, or SC-SM. Clay material shall be a soil material free from root or other organics and frozen material. Clay material shall be free from heavy metals and tested in accordance with EPA SW-846.3-3. Clay material shall conform to the following gradation requirements:

Seive Size	Minimum % Passing
2"	100%
No. 4 (0.187")	85%
No. 200 (0.0029")	12%

1.2.2 Topsoil

Material suitable for topsoils obtained from offsite areas is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

SD-03 Product Data

Soil Materials

Contractor shall submit test data demonstrating that clay and topsoil materials proposed for the project comply with the requirements listed above. One set of tests shall be submitted for each source of material proposed for the project prior to any material being delivered to the site.

An additional representative soil sample classification and gradation test for every 10,000 cy of clay material shall be performed in accordance with ASTM D 2487 and submitted for approval as work progresses. Test results shall be submitted and approved before material represented by the tests is delivered to the site.

An additional organic matter, soluble salt, pH and gradation test for every 10,000 cy of topsoil material shall be performed in accordance with requirements listed in Section 32 92 19 SEEDING and submitted and approved before material represented by the tests is delivered to the site.

Test Reports

Results of testing shall be submitted within 24 hours of conclusion of physical tests, three copies of test results, including calibration curves and results of calibration tests.

Certificates

Qualifications of the commercial testing laboratory (or laboratories), or the Contractor's validated testing facilities shall be submitted for approval prior to tests being performed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 SELECTION OF BORROW MATERIAL

Select borrow material to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Obtain borrow material from the borrow areas from approved private sources.

3.2 PLACING CLAY MATERIAL

Spread clay material evenly to meet grades shown on the plans after compaction. Do not spread clay when frozen or excessively wet or dry. Clay material shall be compacted with a minimum of two passes with compaction equipment.

3.3 PLACING TOPSOIL

On areas to receive topsoil, prepare the compacted subgrade soil to a 2 inch depth for bonding of topsoil with subsoil. Spread topsoil to the grades shown on the plans. Obtain material required for topsoil in excess of that produced by excavation within the grading limits from offsite sources.

-- End of Section --

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

SD-03 Product Data

Nonsaleable Materials

Written permission to dispose of such products on private property shall be filed with the Contracting Officer's representative.

Local Burning Permit

Written permission from local government to burn materials onsite shall be filed with the Contracting Officer's representative.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Roads and Walks

Keep roads and walks free of dirt and debris at all times.

3.1.2 Trees, Shrubs, and Existing Facilities

Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.1.3 Utility Lines

Protect existing utility lines that are indicated to remain from damage. Notify the Contracting Officer immediately of damage to or an encounter with an unknown existing utility line. The Contractor is responsible for the repairs of damage to existing utility lines that are indicated or made known to the Contractor prior to start of clearing and grubbing operations. When utility lines which are to be removed are encountered within the area of operations, notify the Contracting Officer in ample time to minimize interruption of the service.

3.2 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 PRUNING

Trim trees designated to be left standing within the cleared areas of dead branches 1 1/2 inches or more in diameter; and trim branches to heights and in a manner as indicated. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branches. Paint cuts more than 1-1/4 inches in diameter with an approved tree wound paint.

3.5 GRUBBING

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.6 DISPOSAL OF MATERIALS

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility, except when otherwise directed in writing. Burning of material may be performed if local municipalities will permit. Approval for burning must be obtained in writing and submitted to the Contracting Officer's representative.

-- End of Section --

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4972 (2001; R 2007) pH of Soils

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act (1940; R 1988; R 1998) Federal Seed Act

DOA SSIR 42 (1996) Soil Survey Investigation Report
No. 42, Soil Survey Laboratory Methods
Manual, Version 3.0

1.2 DEFINITIONS

1.2.1 Stand of Turf

75 percent ground cover of the established species.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

SD-03 Product Data

Contractor shall submit product data for wood cellulose fiber fertilizer products to be used on the project for approval.

SD-07 Certificates

State certification and approval for seed must be submitted prior to seed being delivered to site.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.4.1.2 Fertilizer Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer may be furnished in bulk with certificate indicating the above information.

1.4.2 Storage

1.4.2.1 Seed and Fertilizer Storage

Store in cool, dry locations away from contaminants.

1.4.2.2 Topsoil

Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.

1.4.2.3 Handling

Do not drop or dump materials from vehicles.

1.5 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.5.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.6 TIME LIMITATIONS

1.6.1 Seed

Apply seed within twenty four hours after seed bed preparation.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Classification

Provide State-certified seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on site in the presence of the Contracting Officer's Representative.

2.1.2 Repository Seed Mixture by Weight

The following seed mixture is to be used for repository areas.

Species	Scientific Name	Planting Rate*
Big Blue Stem	Adnropogon gerardi	2.0
Little Blue Stem	Andropogon scoparius	1.5

Indiangrass	Sorghastrum nutans	2.0
Sidecats Grama	Bouteloua curtipendula	0.5
Switchgrass	Panicum virgatum	1.0
Eastern Gamagrass	Tripsacum dactyloides	1.0
Alfalfa	Medicago sativa	1.0
Sand Lovegrass	Eragrotis frankii	0.25
Maximillian Sunflower	Halianthus maximilianii	0.1
Illinois Bundleflower	Desmanthus illinoensis	0.1
Partridge Pea	Chamaecista fasciculata	0.1
Common	Lespedeza Lespedeza striata	0.1
Purple Prairie Clover	Dalea purpurea	0.1

*pounds of pure live seed per 1,000 sf

2.1.3 General Seed Mixture by Weight

The following seed mixture is to be used for all areas outside repository areas.

Species	Planting Rate*
Fescue (Bravo, Cimmaron, Lanier, Stetson or Wrangler)	4.2
Ryegrass (Certified Commander of Assure)	1.2
Kentucky Bluegrass	0.6

*pounds of pure live seed per 1,000 sf

2.2 TOPSOIL

2.2.1 On-Site Topsoil

On-site topsoil shall not be used for this project.

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor from off-site sources.

2.2.3 Composition

Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D 4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components shall conform to the following limits:

Silt	25-50 percent
Clay	10-30 percent
Sand	20-35 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

2.3 FERTILIZER

2.3.1 Hydroseeding Fertilizer

Controlled release fertilizer, to use with hydroseeding and composed of pills coated with plastic resin to provide a continuous release of nutrients for at least 6 months.

2.4 MULCH

Mulch shall be free from noxious weeds, mold, and other deleterious materials.

2.4.1 Straw

Stalks from oats, wheat, rye, barley, or rice. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

2.4.2 Hay

Air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Hay shall be sterile, containing no fertile seed.

2.4.3 Wood Cellulose Fiber Mulch

Use recovered materials of either paper-based (100 percent) or wood-based (100 percent) hydraulic mulch. Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 5.5 to 8.2. Use with hydraulic application of grass seed and fertilizer.

2.5 WATER

Source of water shall be approved by Contracting Officer and of suitable quality for irrigation, containing no elements toxic to plant life.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 EXTENT OF WORK

Provide soil preparation (including soil conditioners as required), fertilizing, seeding, and surface topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.1.1 Topsoil

Provide 6 inches of off-site topsoil to meet indicated finish grade in repository areas. After areas have been brought to indicated finish grade, incorporate fertilizer, pH adjusters, and soil conditioners into soil a minimum depth of 6 inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions.

Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

3.2 SEEDING

3.2.1 Seed Application Conditions

Immediately before seeding, restore soil to proper grade. Do not seed when ground is muddy, frozen, snow covered, or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in the above conditions, submit a written request to the Contracting Officer stating the special conditions and proposed variance. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

3.2.1.1 Acceptance

Acceptance of permanent seeding will be made when seeded disturbed areas meet the requirements for final stabilization as defined in the current state operating permit for land disturbance. Inspection for acceptance will be made within 60 days after seeding, excluding seeding dates that fall between September 30 and March 1. Seeding that occurs between September 30 and March 1 will be inspected no earlier than May 1.

3.2.2 Seed Application Method

Seeding method shall be hydroseeding.

3.2.2.1 Hydroseeding

First, mix water and fiber. Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. Fiber shall be added at 1,000 pounds, dry weight, per acre. Then add and mix seed and fertilizer to produce a homogeneous slurry. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

3.2.3 Mulching

3.2.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.2.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

3.2.3.3 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

3.2.4 Watering

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of 2 inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

3.4 RESTORATION

Restore to original condition existing turf areas which have been damaged during turf installation operations at the Contractor's expense. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

SECTION 33 24 00.00 20

MONITORING WELLS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C117	(2013) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM D1785	(2012) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D4397	(2010) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D5088	(2002; R 2008) Decontamination of Field Equipment Used at Nonradioactive Waste Sites
ASTM D5092	(2004; E 2010; R 2010) Design and Installation of Ground Water Monitoring Wells in Aquifers
ASTM F480	(2012) Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80
ASTM F883	(2013) Padlocks

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Errata 1-2010; Changes 1-3 2010; Changes 4-6 2011; Change 7 2012) Safety and Health Requirements Manual
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U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 600-4-89-034 (1990) Handbook of Suggested Practices for
the Design and Installation of Groundwater
Monitoring Wells

EPA 600/4-79/020 (1983) Methods for Chemical Analysis of
Water and Wastes

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910 Occupational Safety and Health Standards

1.2 DESCRIPTION OF WORK

Provide monitoring wells including drilling, casing, well screen, gravel packing, grouting, development, monitoring device, and incidental related work complete and ready for operation.

1.3 GENERAL REQUIREMENTS

Each system, including equipment, materials, installation, and performance, shall be in accordance with local, State, and Federal regulations, ASTM D5092, and EPA 600-4-89-034 except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" has been substituted for the word "should" wherever it appears. Reference to the "Project Representative" and the "Owner" shall be interpreted to mean the Contracting Officer. Additional requirements are included under Section 01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS. Mark and secure monitoring wells to avoid unauthorized access and tampering.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.

SD-02 Shop Drawings

Well construction

SD-03 Product Data

Well casing

Well screen

Filter pack

Neat cement grout

Bentonite seal

SD-07 Certificates

Well Drilling/Development Material Handling Plan; G

Health and Safety Plan; G

Installation Survey Report

Well Development Report

Borehole Analysis Report

SD-11 Closeout Submittals

Well Construction Permit

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in an undamaged condition. Unload and store with minimal handling. Store materials in on-site enclosures or under protective coverings. Store plastic piping and jointing materials, and rubber gaskets under cover, out of direct sunlight. Store materials off the ground. Keep insides of pipes and fittings free of dirt and debris. Replace defective or damaged materials with new materials.

1.6 QUALITY ASSURANCE

1.6.1 Required Drawings

Submit well construction drawings showing components and details of well casing, well screen, filter pack, annular seal, and associated items. Drawings shall be prepared by a State certified professional geologist or hydrogeologist, or by a State registered professional civil engineer, hereafter referred to as the Contractor's Professional Consultant (CPC). Drawings shall be sealed.

1.6.2 Well Drilling/Development Material Handling Plan

A material handling plan shall be furnished by the Contractor 15 days prior to initiation of the work that describes phases of dealing with the potentially contaminated soil and groundwater, including the following: a schedule to be employed in the well drilling and development stages, a sequence of operations, the method of drilling and development, material hauling, proposed equipment, handling of the contaminated materials, soil and water testing requirements, and safety precautions and requirements.

1.6.3 Health and Safety Plan (HASP)

Describe safety precautions for each phase of the project as specifically related to handling of soil and water removed during well drilling and development operations. Identify appropriate requirements of 29 CFR 1910 and EM 385-1-1. Identify safety equipment and procedures to be available and used during the project. Furnish the name and qualifications based on education, training, and work experience of the proposed Health and Safety Officer (HASO) and the members of the drill crew. The CPC may perform the responsibilities of the HASO if properly qualified.

1.6.4 Well Development Report

Provide report, containing the following data for each well: project name and location, well designation, date and time of well installation, date and time of well development, static water level from top of well casing before development and 24 hours after development, field measurements of

pH, temperature, and specific conductivity, depth of well from top of casing to bottom of well, screen length, description of development methodology size/capacity of pump or bailer, pumping rate, and recharge rate.

1.6.5 Well Construction Permit

Submit a completed permit application and a proposed method of construction to the appropriate state agency prior to construction of the well. Construction of the wells will not be allowed until an approved Well Construction Permit has been submitted to the Contracting Officer.

PART 2 PRODUCTS

2.1 WELL CASING

2.1.1 PVC Piping

ASTM F480, Type 1, Grade 1, PVC 12454, NSF wc or NSF pw, 2 inch outside diameter Schedule 40 threaded PVC casing, with flush threaded joint fittings. Threaded joints shall be nitrile O-ring gaskets.

2.2 WELL SCREEN

Well screens shall be located as indicated. The length of each screen shall be as indicated. Slot size shall be 0.010 inch. Slotted openings shall be distributed uniformly around the circumference of the screen. Open area shall approach the formation's natural porosity.

2.2.1 PVC Screens

ASTM D1785, PVC 1120, NSF wc or NSF pw, 2 inch outside diameter Schedule 40, screen, Schedule 80, machine-slotted construction, flush threaded joint ends. Slots shall be even in width, length, and separation.

2.3 PRIMARY FILTER PACK

Provide clean, durable, well-rounded, and washed 10-20 silica sand, with less than 5 percent non-siliceous material. The filter pack shall not contain organic matter or friable materials. The filter pack shall allow free flow of water in the well, and shall prevent the infiltration of aquifer materials. Filter pack shall have a 30 percent finer than (d-30) grain size of 75 um (No. 200 sieve)(0.0029 inch), and a uniformity coefficient less than 2.5, in accordance with ASTM C117 and ASTM C136.

2.4 SECONDARY FILTER PACK

Gradation in accordance with ASTM D5092. Provide clean, durable, well-rounded, and washed quartz or granite. Pack shall not contain organic matter or friable materials.

2.5 ANNULAR SEALANTS

2.5.1 Bentonite Seal

Provide powdered, granular, pelletized, or chipped sodium montmorillonite in sealed containers from a commercial source, free of impurities. Diameter of pellets shall be less than one fifth the diameter of the borehole annular space to prevent bridging. Bentonite base grout shall be

in accordance with ASTM D5092.

2.5.2 Neat Cement Grout

Provide neat cement grout in accordance with ASTM D5092. Cement shall be in accordance with ASTM C150/C150M. Quick setting admixtures shall not be allowed. Drilling mud or cuttings shall not be used as a sealing material.

2.6 BOTTOM PLUGS

Provide flush threaded solid plug with nitrile O-ring gaskets at the bottom of the well. Plug shall be the same material as the well screen to which it is attached

2.7 LOCKING WELL CAP

Provide flush threaded, weatherproof, and non-removable locking well cap on the top of the well. Well cap shall be of the same material as the well casing to which it is attached. Well cap shall accommodate padlock. Provide a long shackled padlock in accordance with ASTM F883. Provide two keys for the padlock, and turn them over to the Contracting Officer. Locks at the well site shall be keyed alike.

2.8 WELL HEAD COMPLETIONS

Clearly mark and secure the well to avoid unauthorized access and tampering. Cast the words "MONITORING WELL" on the well head cover. Provide a sign reading, "WELL IS FOR MONITORING AND IS NOT SAFE FOR DRINKING." Provide stamped metal identification tag as follows:

DO NOT DISTURB
ID #: _____ Date: _____
Installed By: EPA Region 7
Total Depth: _____
Screened Interval: _____
TOC Elevation: _____
Other: _____
For Information, Call: _____

2.8.1 Aboveground Completions

Provide protective outer casing around the well casing extending above grade. The diameter of the protective outer casing shall be a minimum of 4 inches larger than the well casing diameter. The top of the protective outer casing shall extend a minimum of 6 inches above the top of the well casing cap. The protective outer casing shall be set in cement grout and the bottom of the protective well casing shall extend to the depth indicated. A 1/4 inch diameter weep hole shall be drilled in the protective outer casing 3 inches above the ground surface. The annular space between the protective outer casing and the well casing shall be filled with pea gravel or coarse sand to just below the level of the cap on the well casing. The locking well cap shall be provided on top of the protective outer casing. Provide 6 inch diameter steel pipe bollards, filled with concrete as indicated to protect the exposed well head.

2.8.1.1 Protective Outer Casing and Bollards

ASTM A53/A53M, Type E or S, Grade B.

2.8.1.2 Well Casing Cap

Provide cap on top of the protective outer casing. Cap shall be flush threaded and of the same material as the protective outer casing. Threaded joints shall be wrapped with fluoropolymer tape and provided with nitrile O-ring gaskets.

2.8.2 At-Grade Completions

Provide aluminum vault box, 30 by 30 inches, with watertight frame and cover. Vault shall support H-20 loading for traffic areas. The frame shall be 6 inches deep, and shall be set in a concrete collar a minimum of 8 inches thick, and extending 4 inches beyond the edge of the frame in all directions. Frame and concrete collar shall be set 3 inches above the existing grade. Locking well cap shall be provided on top of the well casing, which will terminate inside the vault as indicated.

2.9 POLYETHYLENE SHEETING

ASTM D4397.

PART 3 EXECUTION

3.1 GENERAL

Notify the Contracting Officer at least 15 days prior to commencement of work. Locations of wells shall be as indicated. Drilling, installation, and development of the monitoring wells shall be supervised, directed, and monitored by the CPC. Drilling, sampling, and well development equipment introduced to the well shall be decontaminated before and after each use in accordance with ASTM D5088.

3.2 DRILLING

Borehole shall be advanced using appropriate drilling methods. If it is the opinion of the CPC that an alternate drilling method is required, justification for a boring method change shall be submitted to the Contracting Officer, and approval for the change granted prior to drilling. Drill crew shall be experienced and trained in drilling and safety requirements for contaminated sites.

3.2.1 Analysis

The CPC shall review the log data from each borehole and compare the data with the well design requirements. The CPC shall verify the adequacy of the well design, or shall offer a proposed modification to the design based on the geologic and hydrogeologic data obtained from the borehole. This review and analysis shall be conducted for each borehole. The CPC shall submit the borehole boring logs, the analysis of the well design, and any proposed design modifications to the Contracting Officer in a Borehole Analysis Report. Any modifications to the well design approved by the Contracting Officer shall be considered a change to the contract documents and shall be negotiated in accordance with the "CHANGES" clause.

3.2.2 Alignment

Verify that the well is straight by lowering a 10 foot section of 3 inch diameter steel pipe in to the well. For wells deeper than 200 feet, Contractor shall verify that the well is plumb.

3.3 SOIL, DEVELOPMENT WATER, AND DECONTAMINATION FLUIDS

Soil, development water, and decontamination fluids removed from the borehole shall be transported and disposed in the soils receiving pit nearest the well. The collection and transportation activities shall be as described in the Well Drilling/Development Material Handling Plan.

3.4 WELL INSTALLATION

Well installation shall be in accordance with ASTM D5092 and EPA 600-4-89-034, and as indicated on the well construction drawings submitted by the CPC and approved by the Contracting Officer. Borehole shall be stable and shall be verified straight before beginning installation.

3.4.1 Casings and Screens

Well casings, screens, plugs, and caps shall be decontaminated prior to delivery by the manufacturer and shall be certified clean. Materials shall be delivered, stored, and handled in such manner as to ensure that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly prior to installation. If directed by the Contracting Officer, the well screen and casing assembly shall be cleaned with high pressure water prior to installation. Personnel shall wear clean cotton or surgical gloves while handling the assembly. Centralizers shall be used to ensure that the well screen and casing assembly is installed concentrically in the borehole. When the assembly has been installed at the appropriate elevation, it shall be adequately secured to preclude movement during placement of the filter packs and annular seals. The top of the well casing shall be capped during filter pack placement.

3.4.2 Primary and Secondary Filter Packs

Primary and secondary filter packs shall be placed as indicated on the approved well construction drawings to fill the entire annular space between the screen and casing assembly and the outside wall of the borehole. Place both the primary and secondary filters with a tremie pipe in accordance with EPA 600-4-89-034 and ASTM D5092. Placement of the primary and secondary filters by gravity or free fall methods is not allowed. Control speed of filter placement to prevent bridging and to allow for settlement. Prior to commencement of work, equipment and methods required to place filters shall be approved by the Contracting Officer.

3.4.3 Bentonite Seal

Bentonite shall be placed as a slurry through a tremie pipe. Control speed of bentonite placement to prevent bridging or segregation of slurry. Additional water shall be added to the annular space as directed by the CPC to ensure complete hydration of the bentonite. Bentonite shall cure a minimum of 48 hours before the placement of cement grout to ensure complete hydration and expansion of the bentonite.

3.4.4 Neat Cement Grout

Cement grout shall be placed in the annular space above the bentonite seal as indicated on the well construction drawings. Cement grout shall be placed as a slurry through a tremie pipe, and injected under pressure to

reduce chance of voids. Grout shall be injected in one continuous operation until full strength grout flows out at the ground surface without evidence of drilling cuttings or fluid. Cement grout shall cure a minimum of 48 hours before beginning well development operations.

3.4.5 Well Head Completions

Well head completions shall be as indicated and as specified herein.

3.5 WELL DEVELOPMENT

Well development shall be in accordance with EPA 600-4-89-034 and ASTM D5092 except as modified herein. Bailing, surging, and pumping/overpumping/backwashing are acceptable development methods. Air surging and jetting are prohibited. Method of development shall be chosen by the CPC and approved by the Contracting Officer. Well development shall not begin until the well installation is complete and accepted by the Contracting Officer. Well development operations shall be conducted continuously until development water flows clear and free of drilling fluids, cuttings, or other materials. At such time representative water samples shall be tested for pH, temperature, and specific conductivity in accordance with EPA 600/4-79/020. Samples shall be taken every 3 hours. When stabilized readings of these parameters, as accepted by the Contracting Officer, have been achieved for 12 consecutive hours, well development operations shall cease.

3.6 TRANSPORTATION OF CONTAMINATED SOIL AND WATER

The Contractor shall be solely responsible for complying with Federal, State, and local requirements for transporting contaminated materials through the applicable jurisdictions and shall bear responsibility and cost for any noncompliance. In addition to those requirements, the Contractor shall do the following:

- a. Inspect and document vehicles and containers for proper operation and covering.
- b. Inspect vehicles and containers for proper markings, manifest documents, and other requirements for waste shipment.
- c. Perform and document decontamination procedures prior to leaving the worksite and again before leaving the disposal site.

3.7 DISPOSAL OF CONTAMINATED SOIL AND WATER

Contaminated materials removed from the site shall be disposed of in a treatment/disposal facility permitted to accept such materials.

3.8 INSTALLATION SURVEY

Upon completion of well installation and development and acceptance by the Contracting Officer, the vertical and horizontal position of each well shall be determined by a registered land surveyor licensed in the State of Missouri. The survey shall document the vertical elevations of the top of the casing pipe and the ground surface elevation adjacent to each well. The survey shall also determine the horizontal location of each well based on the NAD83 Missouri State Plane, East Zone, US Foot coordinate system. Survey shall be accurate to the nearest .01 foot. This data shall be

submitted with a well location map as the Installation Survey Report.

3.9 CLEANUP

Upon completion of the well construction, remove debris and surplus materials from the jobsite.

-- End of Section --

SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1 GENERAL

1.1 MEASUREMENT AND PAYMENT

1.1.1 Pipe Culverts and Storm Drains

The length of pipe installed will be measured along the centerlines of the pipe from end to end of pipe without deductions for diameter of manholes. Pipe will be paid for at the contract unit price for the number of linear feet of culverts or storm drains placed in the accepted work.

1.1.2 Flared End Sections

Flared end sections will be measured by the unit. Flared end sections will be paid for at the contract unit price for the various sizes in the accepted work.

1.1.3 Backfill Replacing Unstable Material

Payment will be made for the number of cubic yards of select granular material required to replace unstable material for foundations under pipes or drainage structures, which will constitute full compensation for this backfill material, including removal and disposal of unstable material and all excavating, hauling, placing, compacting, and all incidentals necessary to complete the construction of the foundation satisfactorily.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A929/A929M	(2001; R 2007) Standard Specification for Steel Sheet, Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe
ASTM C1103	(2003; R 2009) Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
ASTM C425	(2004; R 2009) Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
ASTM C443	(2011) Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C507	(2013) Standard Specification for Reinforced Concrete Elliptical Culvert,

Storm Drain, and Sewer Pipe

ASTM C655	(2012b) Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C76	(2013a) Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C828	(2011) Low-Pressure Air Test of Vitrified Clay Pipe Lines
ASTM C924	(2002; R 2009) Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
ASTM C990	(2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D1557	(2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³) (2700 kN-m/m ³)
ASTM D2167	(2008) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D3212	(2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D6938	(2010) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM F1417	(2011a) Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Placing Pipe

Submit printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.

SD-04 Samples

Pipe for Culverts and Storm Drains

SD-07 Certificates

Resin Certification
Pipeline Testing
Hydrostatic Test on Watertight Joints
Determination of Density
Frame and Cover for Gratings

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.4.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.1.1 Concrete Pipe

Manufactured in accordance with and conforming to ASTM C76, Class V, or ASTM C655.

2.1.1.1 Reinforced Elliptical Culvert and Storm Drainpipe

Manufactured in accordance with and conforming to ASTM C507. Horizontal elliptical pipe shall be Class HE-IV. Vertical elliptical pipe shall be Class VE-V.

2.2 DRAINAGE STRUCTURES

2.2.1 Flared End Sections

Sections shall be of a standard design fabricated from zinc coated steel sheets meeting requirements of ASTM A929/A929M.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Joints

2.3.1.1 Flexible Watertight Joints

- a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for preformed flexible joint sealants shall conform to ASTM C990, and rubber-type gaskets shall conform to ASTM C443. Factory-fabricated resilient joint materials shall conform to ASTM C425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.
- b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.4 HYDROSTATIC TEST ON WATERTIGHT JOINTS

2.4.1 Concrete Pipe

A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to ASTM C990 or ASTM C443. Test requirements for joints in clay pipe shall conform to ASTM C425. Test requirements for joints in PVC, PE, and PP plastic pipe shall conform to ASTM D3212.

2.5 EROSION CONTROL RIPRAP

Provide nonerodible rock not exceeding 15 inches in its greatest dimension and choked with sufficient small rocks to provide a dense mass with a minimum thickness of as indicated.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of Section 31 00 00 EARTHWORK and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 36 inches to permit

satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

3.1.2 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in Section 31 00 00 EARTHWORK.

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Government.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in granular material minimum 4 inch in depth in trenches with soil foundation. Depth of granular bedding in trenches with rock foundation shall be 1/2 inch in depth per foot of depth of fill, minimum depth of bedding shall be 8 inch up to maximum depth of 24 inches. The middle third of the granular bedding shall be loosely placed. Bell holes and depressions for joints shall be removed and formed so entire barrel of pipe is uniformly supported. The bell hole and depressions for the joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the

same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (percent)
Corrugated Steel and Aluminum Alloy	5
Concrete-Lined Corrugated Steel	3
Ductile Iron Culvert	3
Plastic (PVC, HDPE and PP)	5

Note post installation requirements of paragraph DEFLECTION TESTING in PART 3 of this specification for all pipe products including deflection testing requirements for flexible pipe.

3.3.1 Concrete Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.4 JOINTING

3.4.1 Concrete and Clay Pipe

3.4.1.1 Flexible Watertight Joints

Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

3.5 BACKFILLING

3.5.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the

midpoint (spring line) of RCP or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 12 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.5.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 8 inches. Use select granular material for this entire region of backfill for flexible pipe installations.

3.5.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.5.4 Compaction

3.5.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.5.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

- a. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade

materials and compaction shall control.

- b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
- c. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.5.5 Determination of Density

Testing is the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D6938. When ASTM D6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D6938 results in a wet unit weight of soil and ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D6938. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.6 PIPELINE TESTING

3.6.1 Leakage Tests

Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate. Low pressure air testing for vitrified clay pipes shall conform to ASTM C828. Low pressure air testing for concrete pipes shall conform to ASTM C924. Low pressure air testing for plastic pipe shall conform to ASTM F1417. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C828 or ASTM C924, after consultation with the pipe manufacturer. Testing of individual joints for leakage by low pressure air or water shall conform to ASTM C1103. Prior to exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by the

exfiltration test shall not exceed [250 gallons per inch in diameter per mile of pipeline per day] [0.2 gallons per inch in diameter per 100 feet of pipeline per hour]. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.

3.6.2 Deflection Testing

No sooner than 30 days after completion of installation and final backfill, an initial post installation inspection shall be accomplished. Clean or flush all lines prior to inspection. Perform a deflection test on entire length of installed flexible pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads shall not exceed limits in paragraph PLACING PIPE above as percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a laser profiler or mandrel.

- a. Laser Profiler Inspection: If deflection readings in excess of the allowable deflection of average inside diameter of pipe are obtained, remove pipe which has excessive deflection, and replace with new pipe. Initial post installation inspections of the pipe interior with laser profiling equipment shall utilize low barrel distortion video equipment for pipe sizes 48 inches or less. Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe interior. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition. The video image shall be clear, focused, and relatively free from roll static or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. For initial post installation inspections for pipe sizes larger than 48 inches, visual inspection shall be completed of the pipe interior.
- b. Pull-Through Device Inspection: Pass the pull-through device through each run of pipe by pulling it by hand. If deflection readings in excess of the allowable deflection of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show excess allowable deflections of the average inside diameter of pipe, remove pipe which has excessive deflection, replace with new pipe, and completely retest in same manner and under same conditions. Pull-through device: The mandrel shall be rigid, nonadjustable having a minimum of 9 fins, including pulling rings at each end, engraved with the nominal pipe size and mandrel outside diameter. The mandrel shall be 5 percent less than the certified-actual pipe diameter for Plastic Pipe, 5 percent less than the certified-actual pipe diameter for Corrugated Steel and Aluminum Alloy, 3 percent less than the certified-actual pipe diameter for Concrete-Lined Corrugated Steel and Ductile Iron Culvert provided by manufacturer. When mandrels are utilized to verify deflection of flexible pipe products, the Government will verify the mandrel OD through the use of proving rings that are manufactured with an opening that is certified to be as shown above.
- c. Deflection measuring device: Shall be approved by the Contracting Officer prior to use.

- d. Warranty period test: Pipe found to have a deflection of greater than allowable deflection in paragraph PLACING PIPE above, just prior to end of one-year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection. Inspect 100 percent of all pipe systems under the travel lanes, including curb and gutter. Random inspections of the remaining pipe system outside of the travel lanes shall represent at least 10 percent of the total pipe footage of each pipe size. Inspections shall be made, depending on the pipe size, with video camera or visual observations. In addition, for flexible pipe installations, perform deflection testing on 100 percent of all pipes under the travel lanes, including curb and gutter, with either a laser profiler or 9-fin mandrel. For flexible pipe, random deflection inspections of the pipe system outside of the travel lanes shall represent at least 10 percent of the total pipe footage of each pipe size. When mandrels are utilized to verify deflection of flexible pipe products during the final post installation inspection, the Government will verify the mandrel OD through the use of proving rings.

3.6.3 Post-Installation Inspection

One hundred percent of all reinforced concrete pipe installations shall be checked for joint separations, soil migration through the joint, cracks greater than 0.01 inches, settlement and alignment. One hundred percent of all flexible pipes (HDPE, PVC, CMP, PP) shall be checked for rips, tears, joint separations, soil migration through the joint, cracks, localized bucking, bulges, settlement and alignment.

- a. Replace pipes having cracks greater than 0.1 inches in width or deflection greater than 5 percent deflection. An engineer shall evaluate all pipes with cracks greater than 0.01 inches but less than 0.10 inches to determine if any remediation or repair is required. RCP with crack width less than 0.10 inches and located in a non-corrosive environment (pH 5.5) are generally acceptable. Repair or replace any pipe with crack exhibiting displacement across the crack, exhibiting bulges, creases, tears, spalls, or delamination.
- b. Reports: The deflection results and final post installation inspection report shall include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design, grade, deviation from line, deflection and deformation of flexible pipe systems, inspector notes, condition of joints, condition of pipe wall (e.g. distress, cracking, wall damage dents, bulges, creases, tears, holes, etc.).

-- End of Section --

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
(Test Pit) TP-1	12	1389	866640.5603	641349.5461
TP-1	27	0	866640.5603	641349.5461
TP-2	0	895	866687.2978	641247.3078
TP-2	12	235	866687.2978	641247.3078
TP-2	28	237	866687.2978	641247.3078
TP-3	12	153	866840.1086	641254.9204
TP-3	34	89	866840.1086	641254.9204
TP-4	12	1295	866239.2590	641026.1347
TP-4	55	3093	866239.2590	641026.1347
TP-4	80	825	866239.2590	641026.1347
TP-4	102	396	866239.2590	641026.1347
TP-5	12	2164	866324.8966	641113.7188
TP-5	28	4928	866324.8966	641113.7188
TP-5	49	2586	866324.8966	641113.7188
TP-5	72	1570	866324.8966	641113.7188
TP-5	84	944	866324.8966	641113.7188
TP-5	96	506	866324.8966	641113.7188
TP-5	110	701	866324.8966	641113.7188
TP-5	133	727	866324.8966	641113.7188
TP-5	142	658	866324.8966	641113.7188
TP-5	160	2074	866324.8966	641113.7188
TP-6	12	3627	866502.9838	641157.5107
TP-6	32	2137	866502.9838	641157.5107
TP-6	52	138	866502.9838	641157.5107
TP-7	13	1375	866442.6483	641059.2219
TP-7	32	1118	866442.6483	641059.2219
TP-7	48	1318	866442.6483	641059.2219
TP-7	72	1634	866442.6483	641059.2219
TP-7	96	790	866442.6483	641059.2219
TP-7	117	593	866442.6483	641059.2219
TP-7	128	897	866442.6483	641059.2219
TP-7	138	1260	866442.6483	641059.2219
TP-8	0	55	866699.5612	641031.9736
TP-8	15	151	866699.5612	641031.9736
TP-8	32	165	866699.5612	641031.9736
TP-9	12	387	866637.2792	641141.9402
TP-9	31	1289	866637.2792	641141.9402
TP-9	48	405	866637.2792	641141.9402
TP-9	63	650	866637.2792	641141.9402
TP-9	78	477	866637.2792	641141.9402
TP-9	93	655	866637.2792	641141.9402
TP-9	103	885	866637.2792	641141.9402
TP-9	126	840	866637.2792	641141.9402
TP-9	134	1064	866637.2792	641141.9402

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-9	156	1843	866637.2792	641141.9402
TP-10	0	45	866846.5074	641048.5172
TP-10	15	0	866846.5074	641048.5172
TP-10	38	0	866846.5074	641048.5172
TP-10	86	0	866846.5074	641048.5172
TP-11	12	1708	866930.1985	641119.5577
TP-11	39	80	866930.1985	641119.5577
TP-12	12	22	867039.8782	641056.6571
TP-12	30	48	867039.8782	641056.6571
TP-13	12	1963	866214.4424	640918.2832
TP-13	62	2199	866214.4424	640918.2832
TP-13	80	0	866214.4424	640918.2832
TP-14	12	1321	866308.8412	640838.0442
TP-14	32	72	866308.8412	640838.0442
TP-14	70	2515	866308.8412	640838.0442
TP-14	92	3499	866308.8412	640838.0442
TP-14	126	518	866308.8412	640838.0442
TP-14	126	3796	866308.8412	640838.0442
TP-14	143	79	866308.8412	640838.0442
TP-15	12	1201	866428.0198	640947.7828
TP-15	32	2249	866428.0198	640947.7828
TP-15	50	853	866428.0198	640947.7828
TP-15	62	1210	866428.0198	640947.7828
TP-15	77	1146	866428.0198	640947.7828
TP-15	92	576	866428.0198	640947.7828
TP-15	108	4482	866428.0198	640947.7828
TP-15	115	2160	866428.0198	640947.7828
TP-15	131	1018	866428.0198	640947.7828
TP-15	168	1917	866428.0198	640947.7828
TP-16	12	4907	866458.6992	640833.3244
TP-16	30	74	866458.6992	640833.3244
TP-16	52	2181	866458.6992	640833.3244
TP-16	76	896	866458.6992	640833.3244
TP-16	102	96	866458.6992	640833.3244
TP-17	12	23	866646.3169	640830.9645
TP-17	32	193	866646.3169	640830.9645
TP-18	0	0	866626.2572	640954.8628
TP-18	16	26	866626.2572	640954.8628
TP-18	31	431	866626.2572	640954.8628
TP-18	45	2054	866626.2572	640954.8628
TP-18	60	1448	866626.2572	640954.8628
TP-18	82	1005	866626.2572	640954.8628
TP-18	108	992	866626.2572	640954.8628
TP-18	121	1574	866626.2572	640954.8628

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-18	132	1250	866626.2572	640954.8628
TP-18	134	3920	866626.2572	640954.8628
TP-18	168	3063	866626.2572	640954.8628
TP-19	12	24	866825.6748	640961.9429
TP-19	24	83	866825.6748	640961.9429
TP-19	78	95	866825.6748	640961.9429
TP-19	113	57	866825.6748	640961.9429
TP-20	12	172	866890.5740	640855.7439
TP-20	37	104	866890.5740	640855.7439
TP-22	12	1641	867100.6113	640930.0830
TP-22	31	22	867100.6113	640930.0830
TP-23	12	67	867217.9219	640859.4730
TP-23	32	48	867217.9219	640859.4730
TP-23	64	38	867217.9219	640859.4730
TP-24	12	1287	866286.4216	640730.6658
TP-24	39	360	866286.4216	640730.6658
TP-24	55	2563	866286.4216	640730.6658
TP-24	98	0	866286.4216	640730.6658
TP-25	12	1033	866331.2608	640599.6874
TP-25	44	192	866331.2608	640599.6874
TP-25	70	1158	866331.2608	640599.6874
TP-25	110	3030	866331.2608	640599.6874
TP-25	115	648	866331.2608	640599.6874
TP-26	12	50	866415.0398	640723.5857
TP-26	33	107	866415.0398	640723.5857
TP-26	57	798	866415.0398	640723.5857
TP-26	83	684	866415.0398	640723.5857
TP-26	102	960	866415.0398	640723.5857
TP-26	125	709	866415.0398	640723.5857
TP-26	136	1976	866415.0398	640723.5857
TP-27	12	58	866472.8592	640617.3871
TP-27	38	134	866472.8592	640617.3871
TP-27	47	478	866472.8592	640617.3871
TP-27	74	988	866472.8592	640617.3871
TP-27	94	1831	866472.8592	640617.3871
TP-27	98	142	866472.8592	640617.3871
TP-28	12	88	866600.2976	640674.0265
TP-28	42	2230	866600.2976	640674.0265
TP-28	71	394	866600.2976	640674.0265
TP-29	13	46	866726.5559	640695.2663
TP-29	24	120	866726.5559	640695.2663
TP-30	12	41	866894.1136	640622.1069
TP-30	53	0	866894.1136	640622.1069
TP-30	60	1546	866894.1136	640622.1069

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-30	68	34	866894.1136	640622.1069
TP-31	12	0	866863.4342	640746.0057
TP-31	72	0	866863.4342	640746.0057
TP-31	97	1807	866863.4342	640746.0057
TP-31	116	56	866863.4342	640746.0057
TP-32	12	104	867086.4512	640736.5657
TP-32	41	42	867086.4512	640736.5657
TP-32	80	275	867086.4512	640736.5657
TP-32	103	19	867086.4512	640736.5657
TP-33	12	0	867036.8919	640622.1069
TP-33	33	0	867036.8919	640622.1069
TP-34	12	39	867211.5297	640741.2855
TP-34	50	75	867211.5297	640741.2855
TP-35	12	74	867312.8077	640686.4344
TP-35	40	73	867312.8077	640686.4344
TP-35	67	96	867312.8077	640686.4344
TP-35	78	29	867312.8077	640686.4344
TP-36	12	6408	866302.9413	640526.5284
TP-37	12	619	866325.3608	640415.6097
TP-37	33	604	866325.3608	640415.6097
TP-37	64	1651	866325.3608	640415.6097
TP-37	96	3736	866325.3608	640415.6097
TP-37	138	63	866325.3608	640415.6097
TP-38	12	762	866453.9794	640422.6897
TP-38	43	1330	866453.9794	640422.6897
TP-38	63	758	866453.9794	640422.6897
TP-38	80	2637	866453.9794	640422.6897
TP-38	98	339	866453.9794	640422.6897
TP-39	12	478	866489.3789	640522.9884
TP-39	38	134	866489.3789	640522.9884
TP-39	67	1313	866489.3789	640522.9884
TP-39	97	1292	866489.3789	640522.9884
TP-39	120	650	866489.3789	640522.9884
TP-39	138	1941	866489.3789	640522.9884
TP-40	12	478	866661.6568	640409.7097
TP-40	37	873	866661.6568	640409.7097
TP-40	64	1150	866661.6568	640409.7097
TP-40	94	844	866661.6568	640409.7097
TP-40	135	49	866661.6568	640409.7097
TP-41	12	98	866667.5567	640528.8883
TP-41	36	59	866667.5567	640528.8883
TP-41	63	1420	866667.5567	640528.8883
TP-41	87	2380	866667.5567	640528.8883
TP-41	118	1698	866667.5567	640528.8883

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-41	134	3012	866667.5567	640528.8883
TP-41	147	0	866667.5567	640528.8883
TP-42	12	45	866815.0547	640472.2490
TP-42	53	103	866815.0547	640472.2490
TP-42	80	1776	866815.0547	640472.2490
TP-42	91	159	866815.0547	640472.2490
TP-43	12	29	866941.3130	640492.3087
TP-43	51	531	866941.3130	640492.3087
TP-43	74	1232	866941.3130	640492.3087
TP-43	87	21	866941.3130	640492.3087
TP-44	12	57	867077.0116	640533.6081
TP-44	41	0	867077.0116	640533.6081
TP-44	54	0	867077.0116	640533.6081
TP-45	12	64	867131.2907	640421.5096
TP-45	29	35	867131.2907	640421.5096
TP-45	58	128	867131.2907	640421.5096
TP-45	85	100	867131.2907	640421.5096
TP-45	93	51	867131.2907	640421.5096
TP-50	12	1743	866396.1599	640345.9907
TP-50	46	122	866396.1599	640345.9907
TP-51	12	2065	866516.5186	640311.7710
TP-51	26	104	866516.5186	640311.7710
TP-51	60	0	866516.5186	640311.7710
TP-52	12	489	866688.7965	640317.6709
TP-52	36	1955	866688.7965	640317.6709
TP-52	124	45	866688.7965	640317.6709
TP-53	12	555	866744.2557	640252.7717
TP-53	33	98	866744.2557	640252.7717
TP-53	71	2537	866744.2557	640252.7717
TP-53	109	52	866744.2557	640252.7717
TP-54	60	1671	866929.5132	640335.3706
TP-54	78	0	866929.5132	640335.3706
TP-55	12	39	866877.5940	640231.5319
TP-55	34	31	866877.5940	640231.5319
TP-55	53	58	866877.5940	640231.5319
TP-56	12	58	867126.5709	640335.3706
TP-56	31	94	867126.5709	640335.3706
TP-57	12	38	867068.7514	640243.3318
TP-57	45	31	867068.7514	640243.3318
TP-57	84	0	867068.7514	640243.3318
TP-58	12	0	867260.3306	640264.7882
TP-58	44	23	867260.3306	640264.7882
TP-58	70	266	867260.3306	640264.7882
TP-59	12	72	867361.3880	640215.0123

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-59	48	0	867361.3880	640215.0123
TP-61	12	78	867564.4246	640111.7730
TP-61	37	24	867564.4246	640111.7730
TP-62	1	66	867858.3335	639572.6783
TP-62	12	0	867858.3335	639572.6783
TP-63	1	47	867967.0954	639493.0036
TP-63	12	55	867967.0954	639493.0036
TP-64	1	78	868077.1221	639616.9416
TP-64	12	24	868077.1221	639616.9416
TP-65	1	34	868093.5630	639506.9150
TP-65	12	119	868093.5630	639506.9150
TP-66	1	46	867826.7168	639381.7124
TP-66	12	0	867826.7168	639381.7124
TP-67	1	50	867946.8609	639351.3601
TP-67	12	41	867946.8609	639351.3601
TP-68	12	611	868144.1499	639296.9790
TP-68	27	72	868144.1499	639296.9790
TP-69	12	453	868079.6516	639409.5352
TP-69	30	61	868079.6516	639409.5352
TP-70	1	2846	868356.6153	639321.0078
TP-70	12	23	868356.6153	639321.0078
TP-71	1	143	868242.7947	639401.9470
TP-71	12	31	868242.7947	639401.9470
TP-72	1	428	867811.5406	639159.1296
TP-72	12	118	867811.5406	639159.1296
TP-73	12	417	867958.2427	639178.0997
TP-73	33	84	867958.2427	639178.0997
TP-74	1	2001	868058.1520	639089.5726
TP-74	12	25	868058.1520	639089.5726
TP-74	30	0	868058.1520	639089.5726
TP-75	12	2828	868103.6805	639213.5107
TP-75	39	65	868103.6805	639213.5107
TP-76	12	2226	868324.9986	639114.8659
TP-76	52	19501	868324.9986	639114.8659
TP-76	96	409	868324.9986	639114.8659
TP-76	100	503	868324.9986	639114.8659
TP-77	12	1861	868314.8811	639231.2160
TP-77	36	0	868314.8811	639231.2160
TP-77	52	61	868314.8811	639231.2160
TP-78	1	1280	868464.1128	639224.8926
TP-78	12	293	868464.1128	639224.8926
TP-78	28	34	868464.1128	639224.8926
TP-79	12	2198	868514.6996	639098.4253
TP-79	35	31	868514.6996	639098.4253

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-80	1	66	867747.0421	639018.7506
TP-80	12	37	867747.0421	639018.7506
TP-81	1	1901	867748.1437	638934.1595
TP-81	12	248	867748.1437	638934.1595
TP-82	12	2867	867879.8331	638912.5182
TP-82	26	404	867879.8331	638912.5182
TP-82	41	94	867879.8331	638912.5182
TP-83	12	1546	867919.0378	639023.8093
TP-83	25	378	867919.0378	639023.8093
TP-84	1	405	868027.8000	638958.0463
TP-84	12	0	868027.8000	638958.0463
TP-84	25	40	868027.8000	638958.0463
TP-85	12	1913	868158.0612	638979.5459
TP-85	30	0	868158.0612	638979.5459
TP-86	68	2970	868260.5000	638889.7538
TP-86	95	29	868260.5000	638889.7538
TP-87	12	5618	868324.9986	639027.6036
TP-87	51	0	868324.9986	639027.6036
TP-88	12	4989	868457.7893	639018.7506
TP-88	57	1838	868457.7893	639018.7506
TP-88	112	33	868457.7893	639018.7506
TP-89	1	81	868555.1690	638902.4007
TP-89	12	94	868555.1690	638902.4007
TP-89	37	57	868555.1690	638902.4007
TP-90	1	5931	867751.8833	638826.9712
TP-90	12	59	867751.8833	638826.9712
TP-91	1	680	867836.3871	638722.0616
TP-91	12	99	867836.3871	638722.0616
TP-92	1	3667	867854.5395	638789.8445
TP-92	12	126	867854.5395	638789.8445
TP-93	12	758	867921.5673	638678.5534
TP-93	47	1089	867921.5673	638678.5534
TP-93	64	1255	867921.5673	638678.5534
TP-93	80	33	867921.5673	638678.5534
TP-94	44	407	868070.7990	638688.6705
TP-94	69	814	868070.7990	638688.6705
TP-94	92	41	868070.7990	638688.6705
TP-95	12	1097	868146.6794	638783.5214
TP-95	27	24	868146.6794	638783.5214
TP-96	64	2160	868379.3794	638682.3474
TP-96	73	0	868379.3794	638682.3474
TP-97	58	5939	868279.4701	638770.8744
TP-97	80	0	868279.4701	638770.8744
TP-98	69	2872	868436.2897	638805.0207

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-98	110	0	868436.2897	638805.0207
TP-99	1	96	868556.4338	638724.0815
TP-99	12	67	868556.4338	638724.0815
TP-99	40	70	868556.4338	638724.0815
TP-100	1	4531	867781.5752	638445.0107
TP-100	12	147	867781.5752	638445.0107
TP-101	12	3653	867782.1095	638631.6885
TP-101	51	24	867782.1095	638631.6885
TP-101	86	0	867782.1095	638631.6885
TP-104	39	989	867976.7946	638464.7198
TP-104	61	56	867976.7946	638464.7198
TP-105	24	2476	868131.5032	638461.0293
TP-105	44	0	868131.5032	638461.0293
TP-106	1	747	868322.4691	683482.5289
TP-106	12	248	868322.4691	683482.5289
TP-107	12	1011	868287.0584	638611.5257
TP-107	41	332	868287.0584	638611.5257
TP-108	12	1011	868436.2897	638616.5844
TP-108	29	50	868436.2897	638616.5844
TP-109	24	493	868555.1690	638586.2321
TP-109	59	25	868555.1690	638586.2321
TP-110	1	2614	867664.8385	638243.5054
TP-110	12	36	867664.8385	638243.5054
TP-111	1	1281	867747.0421	638353.5321
TP-111	12	115	867747.0421	638353.5321
TP-112	1	67	867817.8641	638399.0602
TP-112	12	49	867817.8641	638399.0602
TP-113	1	992	867927.8908	638414.2364
TP-113	12	98	867927.8908	638414.2364
TP-114	1	2393	867663.5737	638165.0955
TP-114	12	116	867663.5737	638165.0955
TP-115	1	10085	867611.7221	638041.1574
TP-115	12	80	867611.7221	638041.1574
TP-116	1	2179	867535.8417	637928.6012
TP-116	12	199	867535.8417	637928.6012
TP-117	12	5132	867457.4317	637840.0741
TP-117	39	70	867457.4317	637840.0741
TP-118	12	3142	867650.9271	637985.5118
TP-118	33	64	867650.9271	637985.5118
TP-119	1	4444	867591.4872	637872.9556
TP-119	12	97	867591.4872	637872.9556
TP-120	12	2028	867283.8258	637757.1606
TP-120	50	158	867283.8258	637757.1606
TP-121	12	5930	867379.0218	637773.0464

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
TP-121	26	6721	867379.0218	637773.0464
TP-121	45	153	867379.0218	637773.0464
TP-122	12	3382	867551.0175	637784.4286
TP-122	55	97	867551.0175	637784.4286
(Surface Sample)SS-1		845	866624.4567	641414.9379
SS-2		1476	866699.5722	641375.9448
SS-3		573	866774.6645	641328.2915
SS-3A		231	866788.9530	641328.8740
SS-4		0	866850.9412	641286.2380
SS-5		87	866917.9747	641218.2557
SS-6		718	866987.1966	641146.8907
SS-6A		985	866993.2280	641151.7040
SS-6B		292	867007.5970	641161.7490
SS-7		535	867056.8960	641074.1529
SS-7A		301	867076.9500	641089.9410
SS-8		570	867127.2039	641003.6975
SS-8A		482	867138.8510	641025.3230
SS-9		1349	867190.6234	640936.3757
SS-9A		1784	867204.5080	640960.0690
SS-10		45	867243.2284	640866.3448
SS-11		23	867228.7142	640769.2109
SS-12		28	867349.1660	640721.6280
SS-13		42	867359.2490	640618.7997
SS-14		36	867414.3579	640532.1710
SS-15		30	867474.6204	640451.4293
SS-16		38	867524.6296	640363.4564
SS-17		33	867576.2331	640274.7365
SS-18		46	867582.6536	640167.0365
SS-19		66	867452.8130	640108.7100
SS-20		49	867376.8691	640181.6014
SS-21		45	867294.9247	640234.3792
SS-22		320	867215.0636	640287.1569
SS-23		53	867156.7302	640283.6847
SS-24		106	867081.0358	640216.3236
SS-25		0	866990.0636	640180.2125
SS-26		2330	866890.0636	640178.1292
SS-26A		50	866871.0200	640133.0900
SS-27		429	866799.7858	640212.1569
SS-27A		3775	866794.5930	640157.4970
SS-27B		17	866780.4470	640114.1580
SS-28		365	866678.4304	640237.3224
SS-29		3388	866583.6577	640279.3722
SS-29A		20	866551.0300	640229.5790
SS-30		632	866485.1002	640296.2962

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
SS-30A		48	866473.7260	640223.6000
SS-31		871	866389.8839	640326.4278
SS-31A		71	866375.4050	640268.4800
SS-32		857	866300.5005	640364.0750
SS-32A		25	866267.2680	640291.4710
SS-33		1032	866256.2682	640453.6482
SS-33A		0	866198.0810	640394.2690
SS-34		971	866176.5604	640510.1516
SS-34A		0	866122.7090	640480.9040
SS-35		1634	866152.8728	640585.9017
SS-35A		407	866094.5910	640549.7410
SS-35B		31	866037.6060	640510.9770
SS-36		1903	866123.6798	640673.1922
SS-36A		23	866018.8460	640649.8280
SS-37		1501	866096.9213	640731.2921
SS-37A		1159	866018.4820	640758.6850
SS-37B		0	865973.1340	640760.6350
SS-38		1278	866227.8302	640762.8324
SS-38A		370	866113.0150	640820.1730
SS-39		245	866191.2631	640855.7759
SS-40		1898	866136.6455	640936.9563
SS-40A		4944	866068.5330	640963.8320
SS-40B		4090	866014.8460	640965.2810
SS-40C		28	865990.1800	641000.4120
SS-41		2578	866141.1287	641028.6130
SS-42		1227	866214.3520	641083.2812
SS-43		296	866260.0587	641153.3555
SS-44		1064	866338.5140	641192.4374
SS-45		1808	866431.8808	641211.8368
SS-46		3581	866518.8510	641252.7154
SS-47		2416	866564.8273	641298.3051
SS-48		959	866625.0053	641349.6509
SS-49		131	868049.8895	639642.1876
SS-50		754	868126.9728	639573.4376
SS-51		78	868195.0284	639506.7709
SS-52		74	868268.6395	639441.4931
SS-53		55	868347.1117	639380.3820
SS-54		1093	868421.4172	639309.5487
SS-55		440	868492.2506	639238.7153
SS-56		1304	868555.4450	639159.5487
SS-56A		439	868538.5190	639238.3640
SS-57		366	868507.5284	639072.7431
SS-58		229	868481.8339	638976.9098
SS-59		202	868573.8110	638901.1090

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
SS-60		78	868583.1120	638797.3405
SS-61		217	868604.7917	638701.2271
SS-62		499	868575.1627	638604.3910
SS-62A		1572	868584.5960	638560.9790
SS-62B		1304	868626.5170	638533.6110
SS-62C		600	868668.0900	638510.4280
SS-62D		138	868692.1510	638489.6850
SS-63		675	868509.4010	638529.9574
SS-63A		456	868522.0170	638488.6910
SS-63B		381	868534.4520	638436.3230
SS-64		1107	868410.3970	638529.9574
SS-64A		897	868448.4520	638467.0520
SS-64B		1264	868462.8460	638396.4160
SS-64C		72	868456.6780	638346.9880
SS-65		106	868363.4243	638441.7932
SS-66		109	868272.3695	638413.6096
SS-67		63	868177.7014	638389.7619
SS-68		801	868096.0412	638439.6253
SS-68A		44	868102.6920	638391.6700
SS-69		1093	867994.1465	638430.9534
SS-69A		484	867985.9210	638377.3670
SS-69B		45	868006.7590	638338.1890
SS-70		203	867913.9316	638385.4260
SS-71		1154	867843.8339	638339.1759
SS-71A		187	867899.6360	638314.4490
SS-72		166	867793.9706	638259.6837
SS-73		56	867728.2088	638175.8555
SS-74		247	867700.0251	638081.1874
SS-75		64	867679.0681	637982.9061
SS-76		116	867631.3727	637893.2966
SS-77		87	867616.9196	637796.4606
SS-78		5906	867554.0484	637727.8081
SS-78A		151	867597.7470	637689.7700
SS-79		4609	867467.3296	637765.3863
SS-79A		985	867464.9650	637669.3600
SS-79B		67	867475.4630	637604.6960
SS-80		2125	867372.6615	637745.8746
SS-81		999	867274.3802	637722.0269
SS-82		343	867178.9895	637745.8746
SS-83		203	867257.7591	637804.4098
SS-84		89	867345.2006	637854.2731
SS-85		636	867419.6342	637914.9763
SS-85A		191	867365.7790	637944.4000
SS-86		130	867472.3882	637996.6365

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
SS-87		59	867529.4781	638071.0702
SS-88		136	867567.0563	638161.4023
SS-89		1571	867616.1969	638245.2305
SS-89A		66	867581.6180	638235.5370
SS-90		35	867663.8923	638332.6720
SS-91		2388	867723.1502	638412.1643
SS-91A		37	867680.6540	638430.1530
SS-92		50	867709.4197	638506.8324
SS-93		29	867646.5485	638581.9887
SS-94		63	867622.7009	638675.9341
SS-95		52	867606.0797	638773.4928
SS-96		44	867618.3649	638871.7741
SS-97		38	867663.1696	638959.2156
SS-98		1227	867737.6033	639026.4227
SS-98A		293	867680.2550	639046.2580
SS-99		2281	867758.3490	639162.3940
SS-99A		45	867700.2340	639175.3220
SS-100		133	867877.7988	639163.0049
SS-101		218	867853.9511	639256.9503
SS-102		30	867805.3240	639378.0280
SS-103		19	867881.4121	639435.4466
SS-104		47	867949.3418	639506.2670
SS-105		26	867951.5098	639605.9936
(Flood Plain) FP-1		265	866473.4100	641923.6550
FP-2		289	866480.1570	641925.4820
FP-3		254	866701.6810	642140.4030
FP-4		197	866715.8160	642133.3050
FP-5		164	866910.5290	642274.1929
FP-5	12	131	866910.5290	642274.1929
FP-6		31	866927.5463	642263.3868
FP-7		97	867098.6939	642418.4413
FP-8		95	867108.7887	642401.1411
FP-9		90	867290.6952	642531.8994
FP-10		62	867303.3202	642516.4467
FP-11		71	867370.6140	642730.5535
FP-12		62	867389.7626	642736.5463
FP-13		98	867355.2777	642970.2548
FP-14		61	867374.3752	642964.1784
FP-15		88	867465.5905	643198.3636
FP-16		87	867479.9655	643184.6136
FP-17		2593	869324.2577	638521.7870
FP-17	6	3211	869324.2577	638521.7870
FP-17	12	2890	869324.2577	638521.7870
FP-17	18	3373	869324.2577	638521.7870

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
FP-17	24	5528	869324.2577	638521.7870
FP-17A		279	869296.4320	638600.0110
FP-18		5574	869325.7581	638501.8038
FP-18	12	1488	869325.7581	638501.8038
FP-18	24	1901	869325.7581	638501.8038
FP-19		8991	869567.2622	638570.1508
FP-19	6	331	869567.2622	638570.1508
FP-19	12	4111	869567.2622	638570.1508
FP-19A		350	869560.4700	638634.9020
FP-20		8098	869573.1050	638550.9451
FP-20A		348	869586.0390	638488.4980
FP-21		5682	869728.3030	638666.1600
FP-21	6	9020	869728.3030	638666.1600
FP-21	12	2952	869728.3030	638666.1600
FP-21	24	5317	869728.3030	638666.1600
FP-21	18	112	869728.3030	638666.1600
FP-21A		175	869715.3120	638719.9940
FP-22		4804	869725.1320	638641.9700
FP-22	6	3719	869725.1310	638641.9700
FP-22	12	4417	869725.1310	638641.9700
FP-22	18	4668	869725.1310	638641.9700
FP-22	24	7398	869725.1320	638641.9700
FP-25		789	870199.3810	638944.6575
FP-25	6	531	870199.3810	638944.6575
FP-25A		397	870199.6670	639020.1970
FP-26		7987	870207.1621	638926.2508
FP-26	6	5681	870207.1621	638926.2508
FP-26A		62	870232.7210	638875.4000
FP-27		3964	870467.1750	639025.0820
FP-27	6	602	870467.1750	639025.0820
FP-27	12	1533	870467.1750	639025.0820
FP-27A		710	870500.5450	639069.4880
FP-27A	6	682	870500.5280	639069.4470
FP-27A	12	349	870500.5280	639069.4470
FP-27B		75	870534.5980	639087.4750
FP-28	6	173	870441.7040	639012.1760
FP-28A		6211	870407.6690	638949.3030
FP-28A	6	5160	870407.6690	638949.3030
FP-28B		183	870391.5660	638874.5120
FP-31		274	866856.6209	638739.8423
FP-32		561	866876.3332	638735.2160
FP-32	6	1400	866876.3332	638735.2160
FP-32	12	1600	866876.3332	638735.2160
FP-32	24	2720	866876.3332	638735.2160

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
FP-32	30	909	866876.3332	638735.2160
FP-32	36	1287	866876.3332	638735.2160
FP-32A		204	866954.7200	638694.1100
FP-33		521	866724.6383	638544.4759
FP-33	6	1481	866724.6383	638544.4759
FP-33	12	1296	866724.6383	638544.4759
FP-33	18	2341	866724.6383	638544.4759
FP-33	26	2172	866724.6383	638544.4759
FP-33A		1187	866665.8480	638599.7890
FP-33A	6	75	866665.8480	638599.7890
FP-33B		1179	866627.3110	638637.1130
FP-33B	6	31	866627.3110	638637.1130
FP-33C		65	866593.7160	638687.1790
FP-34		173	866735.6989	638527.7758
FP-34A		347	866707.1180	638516.7230
FP-35		133	866483.9670	638433.4160
FP-36		82	866521.6695	638397.7131
FP-36A		376	866484.8720	638407.7850
FP-37		395	866378.8808	638226.1639
FP-38		290	866398.0707	638220.3070
FP-38A		120	866382.3710	638218.1530
FP-39		29	866239.8770	638016.3450
FP-40		202	866287.8002	637999.6840
FP-40	6	206	866287.8002	637999.6840
FP-41		113	866354.7610	637774.0500
FP-42		164	866374.2692	637778.6733
FP-42A	6	111	866374.2692	637778.6733
FP-43		112	866388.0379	637534.1499
FP-44		55	866408.0378	637532.2056
FP-45		77	866444.4761	637310.8682
FP-46		206	866461.8458	637320.6920
FP-47		182	866495.1510	637129.2840
FP-48		363	866551.4847	637097.5267
FP-48A		254	866510.7300	637120.9810
FP-49		1086	866415.9568	636890.4090
FP-49	6	1213	866415.9568	636890.4090
FP-49	12	989	866415.9568	636890.4090
FP-49	18	1032	866415.9568	636890.4090
FP-49	24	96	866415.9568	636890.4090
FP-49A		46	866337.5660	636890.3770
FP-50		1730	866435.8140	636890.5219
FP-50	6	1936	866435.8140	636890.5219
FP-50	12	1819	866435.8140	636890.5219
FP-50	18	379	866435.8140	636890.5219

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
FP-50A		20	866513.6880	636865.8350
FP-51		155	866379.7750	636642.1240
FP-52		81	866433.1949	636641.2153
FP-52A		317	866413.0650	636644.7620
FP-53		258	866308.0449	636426.9388
FP-54		210	866325.0780	636416.1885
FP-54A		178	866315.3980	636431.2020
FP-55		33	866124.2520	636226.9690
FP-56		589	866181.2693	636218.1115
FP-56	6	759	866181.2693	636218.1115
FP-56	12	638	866181.2693	636218.1115
FP-56	18	589	866181.2693	636218.1115
FP-56	24	753	866181.2693	636218.1115
FP-56A		52	866247.3740	636202.5210
FP-57		624	866231.2488	636036.6548
FP-57	6	719	866231.2488	636036.6548
FP-57	12	133	866231.2488	636036.6548
FP-57A		1304	866175.5380	636062.7670
FP-57A	6	1009	866175.5380	636062.7670
FP-57A	12	610	866175.5380	636062.7670
FP-57A	18	898	866175.5380	636062.7670
FP-57A	24	231	866175.5380	636062.7670
FP-57B		1259	866121.9110	636084.2250
FP-57B	6	883	866121.9110	636084.2250
FP-57B	12	1309	866121.9110	636084.2250
FP-57B	18	256	866121.9110	636084.2220
FP-57C		53	866082.0350	636105.5240
FP-58		26	866270.7950	636032.9460
FP-59		229	866212.2046	635809.9834
FP-60		419	866232.3433	635805.5388
FP-60	6	339	866232.3433	635805.5388
FP-60A		33	866276.7700	635789.7930
FP-61		58	867564.4246	640111.7730
FP-62		458	866235.9545	635578.1082
FP-62	6	654	866235.9545	635578.1082
FP-62	12	1051	866235.9545	635578.1082
FP-62	18	414	866235.9545	635578.1082
FP-62	24	397	866235.9545	635578.1082
FP-62A		288	866283.8000	635574.8280
FP-63		220	866224.8781	635337.7957
FP-64		77	866244.0447	635331.8236
FP-65		250	866119.0335	635119.5389
FP-66		335	866139.2005	635120.2610
FP-67		341	865963.2697	634944.2971

Madison County Mines Site
Operable Unit 05: Catherine Mines and Skaggs Tailings Subsites
Sampling Results

Sample ID	Sample Depth (in)	Pb (ppm)	Easting	Northing
FP-68		575	865976.1030	634929.0055
FP-68	6	547	865976.1030	634929.0055
FP-68	12	227	865976.1030	634929.0055
FP-68A		824	865976.1030	634929.0055
FP-68A	6	1505	865976.1030	634929.0055
FP-68A	12	1637	865976.1030	634929.0055
FP-68A	18	1257	865976.1030	634929.0055
FP-68A	24	329	865976.1030	634929.0055
FP-69		63	865892.0930	634854.1040
FP-70		338	865908.8660	634858.6360
FP-87		45	865747.2250	632597.7530
FP-88		28	865751.1740	632562.6700
FP-89		201	865623.2860	632518.0980
FP-90		207	865639.9429	632469.7588
FP-91		334	865498.4140	632293.4225
FP-92		109	865509.9973	632277.0892
FP-93		113	865270.9920	632234.0920
FP-94		152	865294.3865	632170.7000
FP-95		196	865096.5851	632038.5529
FP-96		59	865106.7934	632021.3446
FP-97		84	864871.6338	631937.4127
FP-98		329	864878.5088	631918.5584